TECHNICAL MANUAL

OPERATOR'S, AVIATION UNIT, AND INTERMEDIATE MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST FOR GASOLINE ENGINE DRIVEN HYDRAULIC SYSTEMS TEST STAND TYPE D5-C

HEADQUARTERS, DEPARTMENT OF THE ARMY

30 MAY 1980

CHANGE NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 July 1988

Operator's Aviation Unit and Intermediate Maintenance Manual
Including Repair Parts and Special Tools List
Gasoline Engine Driven
Hydraulic Systems Test Stand
TYPE D–5C

TM 55-4920-384-13&P, 30 May 1980, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
i and ii	i and ii
1-1 and 1-2	1-1 and 1-2
A-1/A-2	A-1/A-2
B-1 through B-4	B-1 through B-4
C-1 through C-33/C-34	C-1 through C-4
-----	C-5 through Fig C–1
-----	C-1-1 through C-11-1,
	I-1 through I-11/12
D–41 and D-42	D-42 and D-42

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

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To be distributed in accordance with DA Form 12-31, AVUM and AVIM maintenance requirements for All Fixed and Rotary Wing Aircraft.

CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 25 June 1981

Operator's, Aviation Unit, and Intermediate
Maintenance Manual
(Including Repair Parts and Special Tools Lists)

GASOLINE ENGINE DRIVEN
HYDRAULIC SYSTEMS TEST STAND
TYPE D5-3
NSN 4920-00-573-6168

TM 55-4920-384-13&P, 30 May 1980, is changed as follows:

1. Title is changed as shown above.

2. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Appendix C	C-1/C-2	C-1 thru C-33/C-34

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WARNING

PRECAUTIONARY DATA

Personnel performing instructions involving operations, procedures, and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, an aborted mission, or destruction of material.

Secure all connections to prevent leakage or loosening due to vibration. Stop operation immediately if a defect is noted that could cause damage to the tester by continuing operation. Solvents, engine oil, fuel and hydraulic fluids are highly combustionable. Observe all safety precautions during handling of these fluids.

TECHNICAL MANUAL

NO. 55-4920-384-13&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 30 May 1980

OPERATOR'S, AVIATION UNIT AND INTERMEDIATE MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST GASOLINE ENGINE DRIVEN HYDRAULIC SYSTEMS TEST STAND TYPE D-5C

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Aviation Systems Command, ATTN: AMSAV-MMD, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798, A reply will be furnished directly to you.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

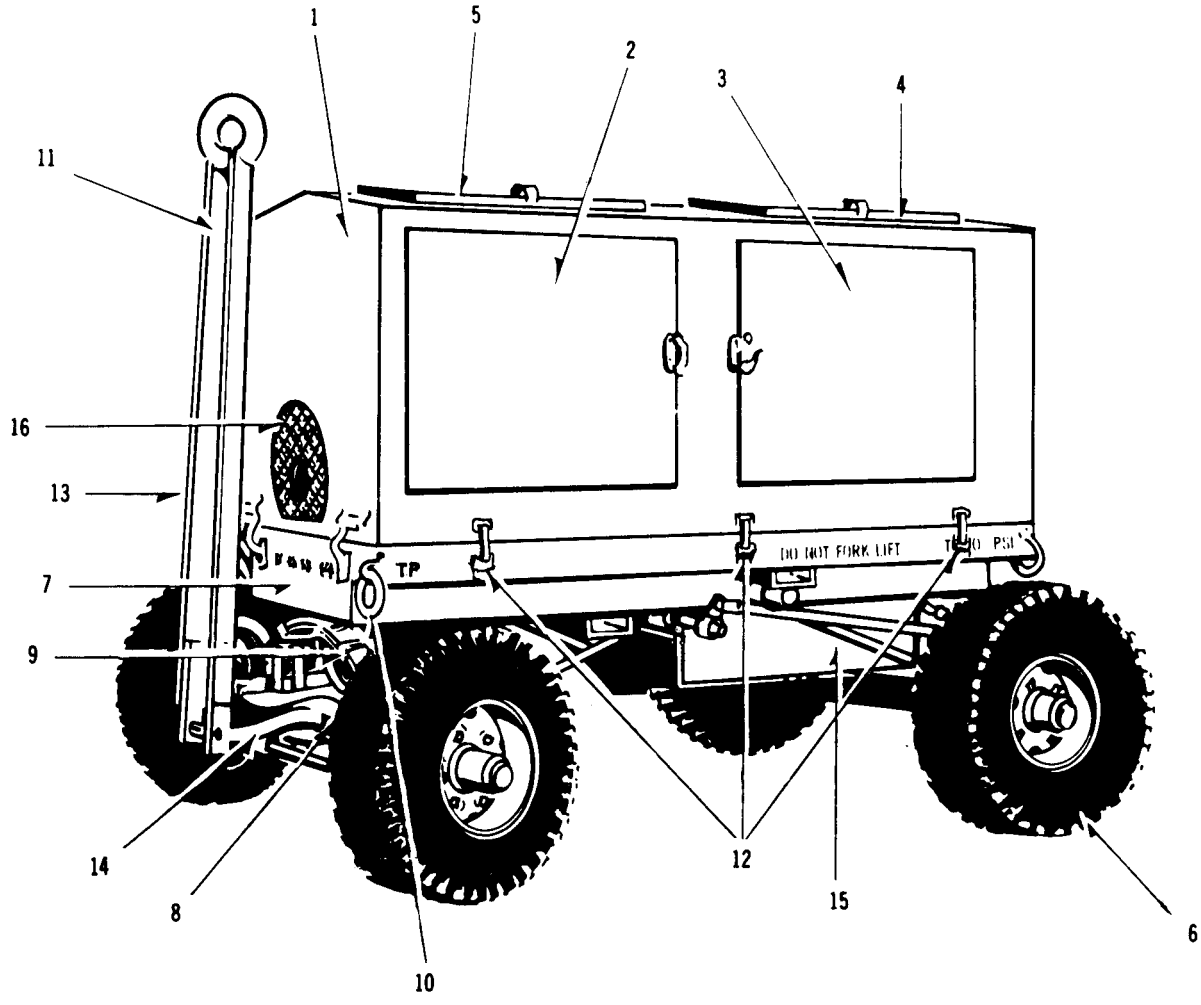
1-1. General. This document is issued as the sole handbook of the Gasoline Engine Driven Hydraulic Test Stand, Type D-5C, This unit, hereafter referred to as the "Test Stand", is built to specification MIL-T-7612C. The unit is identified by the manufacturer as P/N 74TS1000 and by the government with National Stock Number 4920-00-573-6168, This publication is issued as the operating instructions and maintenance instructions for aviation unit and intermediate maintenance levels.

1-2. Scope. The purpose of the test stand is to provide an external means to test and monitor aircraft hydraulic system component performance.

Maintenance Forms, Records and Reports. Maintenance Forms, Records and Reports which are to be used by maintenance personnel at all levels are listed in and prescribed by DA PAM 738-751.

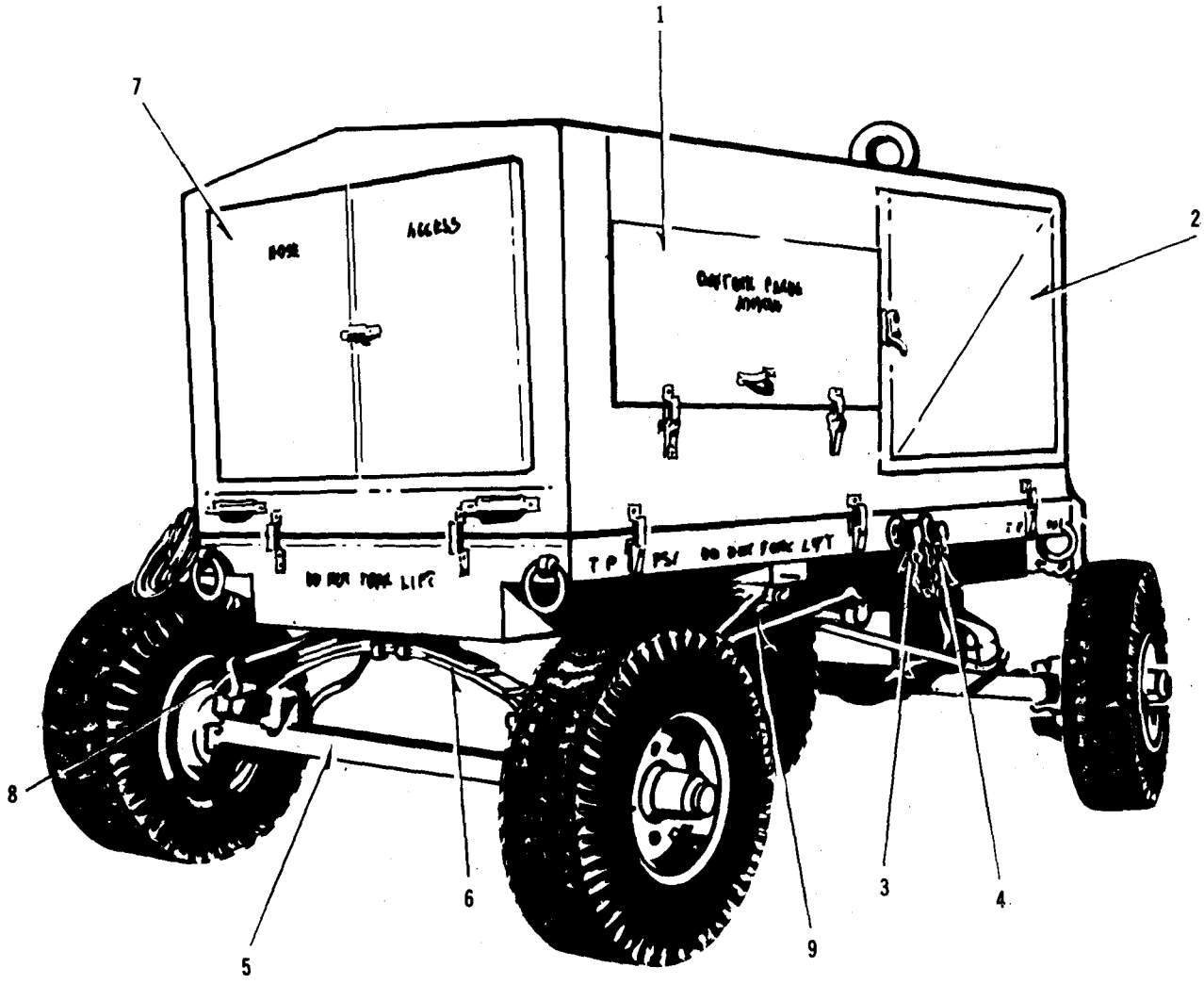
Section II. DESCRIPTION AND LEADING PARTICULARS

1-4. Description. The aircraft hydraulic test stand consists of a gasoline engine driven, variable volume, variable pressure, axial piston-type hydraulic pump. The necessary controls and instruments are included to select and control the desired phase of operation. The entire unit is trailer mounted for mobility (Fig. 1-1) and protected from weather by a removable housing assembly fitted with hinged doors and access panels. (Fig. 1-2) The purpose of the aircraft hydraulic test stand is to perform the following test operations on aircraft hydraulic systems; flush or fill the system with micronically filtered hydraulic fluid, through high pressure and low pressure hoses (Fig, 1-3) provide a source of hydraulic pressure for testing aircraft hydraulic systems without the necessity of operating the aircraft hydraulic system, including aircraft with pressurized reservoir system dimensions of the D5C Hydraulic Test Stand (Fig. 1-4).



1. Housing Assembly
2. Engine Access Door Assembly Left Side
3. Fuel Tank Access Door Assembly
4. Fluid Tank Overhead Access Door Assembly
5. Engine Overhead Door Assembly
6. Pneumatic Tire
7. Frame Assembly
8. Front Axle Assembly
9. Front Spring Assembly
10. Tie Down Ring
11. Draw Bar Assembly
12. Hold Down Latch
13. Brake Lever Assembly
14. Steering Assembly
15. Gasoline Tank
16. Air Intake Screen

Figure 1-1. Hydraulic Test Stand, D-5C Three-Quarters Left Front View



1. Control Panel Access Door Assembly
2. Engine Access Door Assembly-Right Side
3. Three-Quarter Inch Outlet Coupling With Dust Cap
4. One-Half Inch Return Coupling With Dust Cap
5. Rear Axle Assembly
6. Rear Spring Assembly And Shackles
7. Rear Access Door Assembly
8. Brake Lever
9. Brake Lever Tie Rod

Figure 1-2. Hydraulic Test Stand, D-5C Three-Quarter Right Rear View

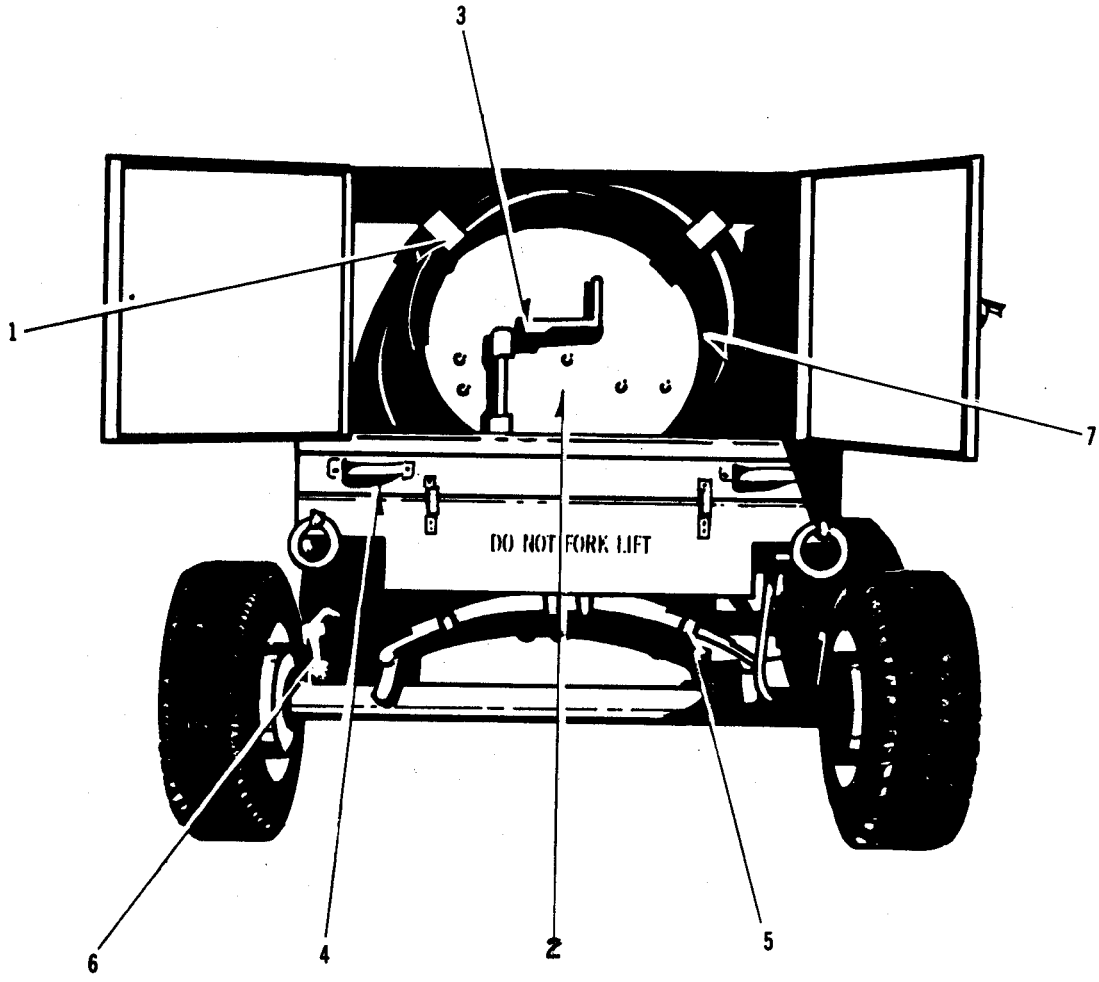


Figure l-3. Hydraulic Test Stand, D-5C

Rear View

1. Hose Hook
2. Rear Bulkhead
3. Engine Crank
4. Lift Handle
5. Rear Spring Assembly
6. Brake Rod
7. Hose

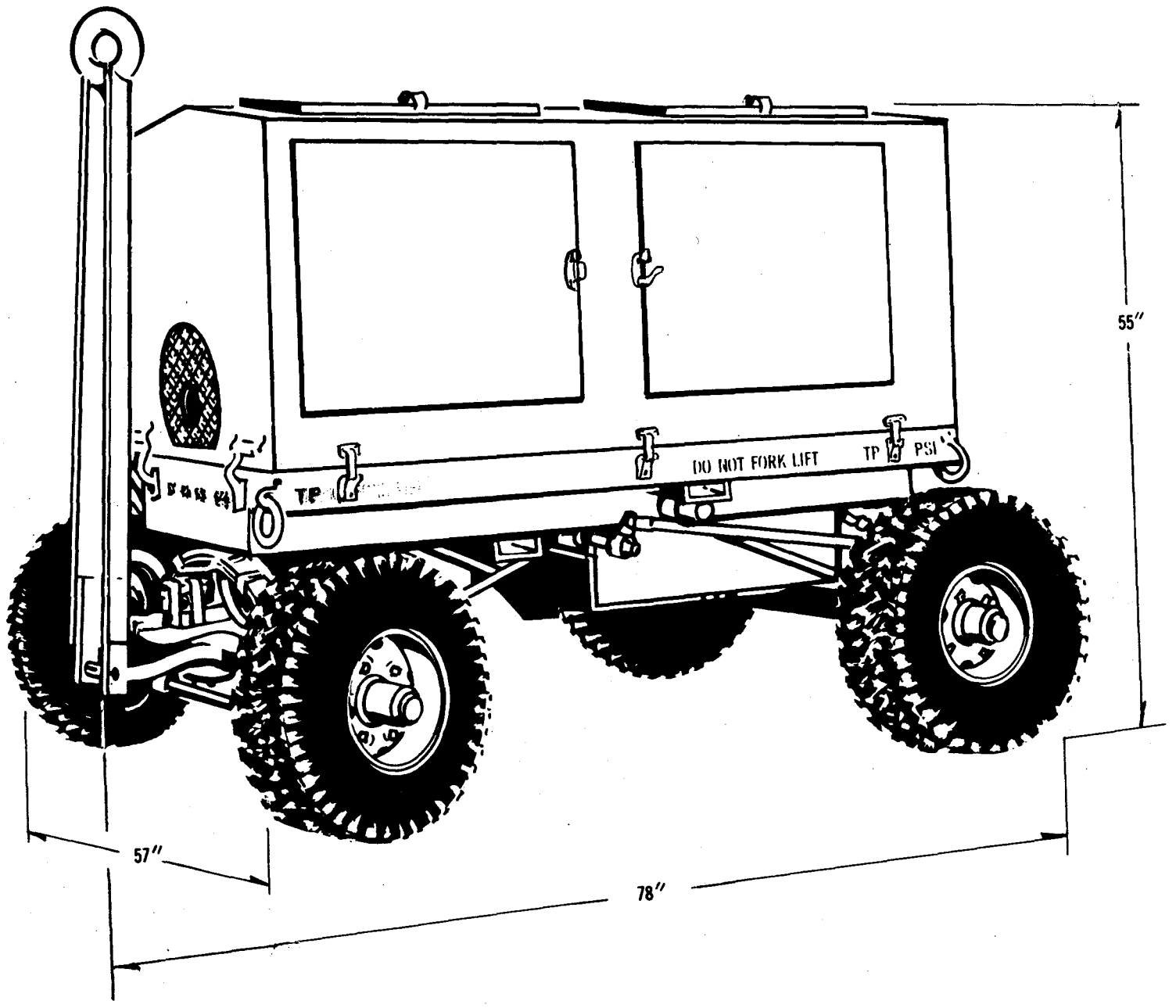


Figure 1-4. Shipping Dimensions

INFORMATION.

a. Trailer and Running Gear Assembly. The frame assembly (fig. 1-1) is of a welded steel construction on which is mounted the identification plate (Fig. 1-5) furnished with a hinged draw bar (11 Fig. 1-1). assembly suitable for vehicle towing. Springs are provided to insure good riding qualities

b. Engine. The engine (Appendix D) is a V-type, 4 cylinder, 4 cycle, air cooled unit leading particulars are stamped on the date plate (Fig. 1-6). A 24 volt battery is employed to power the starter. Engine speed is held automatically at the selected RPM (Revolutions Per Minute) by a centrifugal flyweight governor which adjusts the throttle to compensate for changes in engine load. A maximum RPM stop is also provided. Engine preservation and packaging for shipping or storage per continuation sheet (Fig. 1-7).

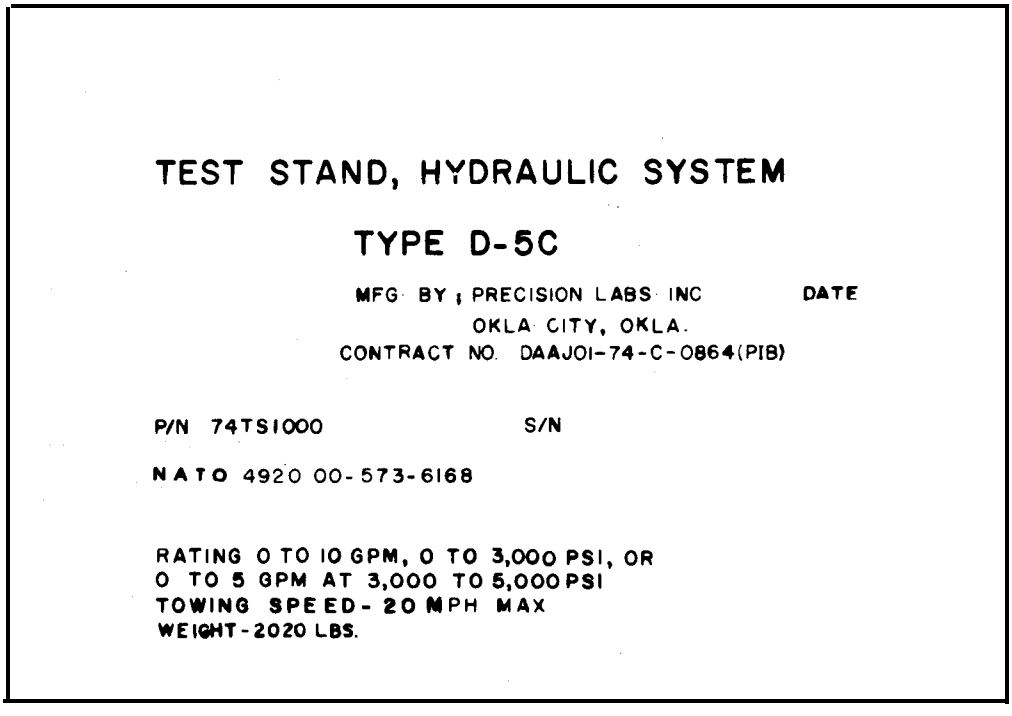
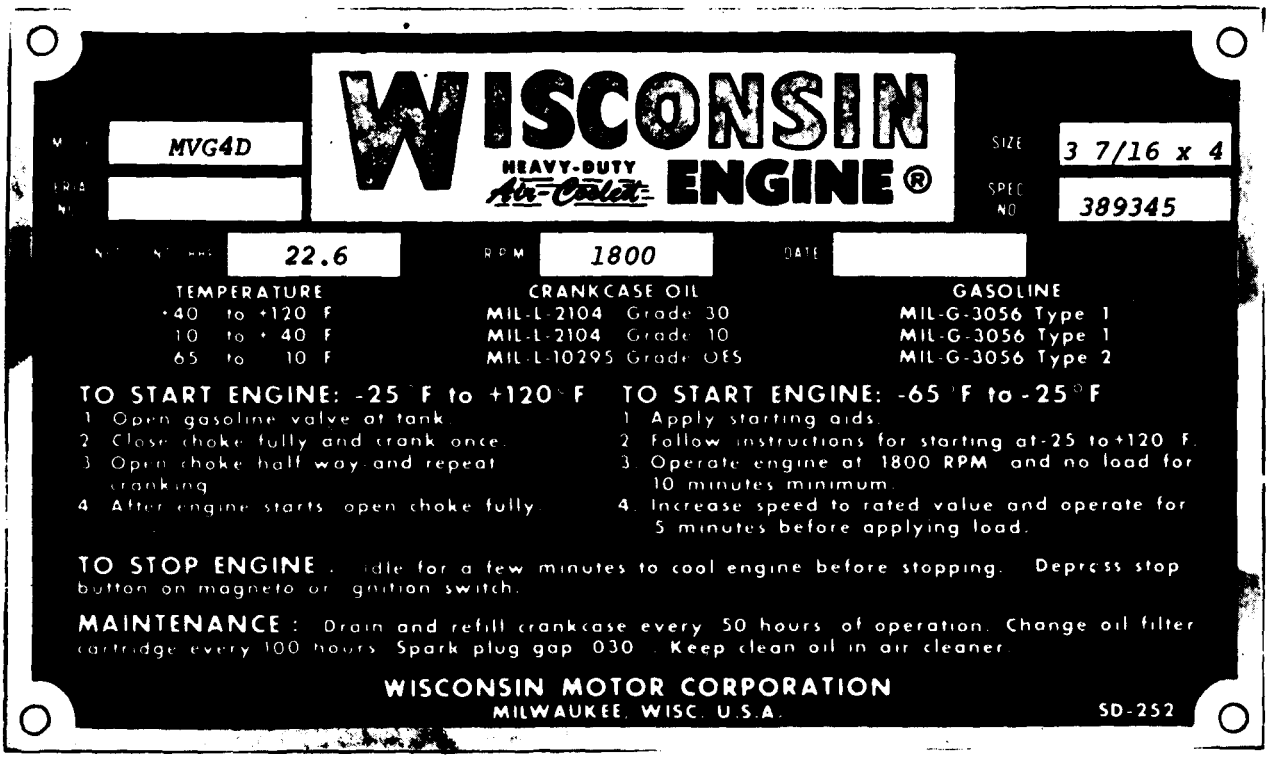


Figure 1-5. Hydraulic Test Stand Identification Place

without materially increasing height. A knuckle-type steering apparatus incorporating tie rods and king pins, are used to provide positive steering. Rear wheels are equipped with mechanical parking brakes, set by a brake lever assembly to hold the test stand in a fixed position during operations. The trailer rolls on pneumatic tires. Tie-down rings are provided for lifting or lashing down the test stand.

c. Hydraulic Fluid Reservoir. This reservoir (fig. 1-8) is mounted in the upper rear of the housing assembly with the reservoir fill cap accessible through the fluid tank overhead access door assembly. A reservoir selector valve (fig. 1-9) is provided for isolating the test stand reservoir from the hydraulic system when using fluid from the aircraft reservoir or when the test stand is utilized to drain the hydraulic system of the aircraft. Door assemblies provide access to the reservoir for service and maintenance.



NOTE

Engine data plate, Figure 1-6, indicates starting aids in the event battery is dead or missng. Refer to paragraph 1-8h for electrical starting.

Figure 1-6. Engine Data Plate

CONTINUATION SHEET
(AVSCOM Suppl 1 to AR 700-15)

REF NO OF DOCUMENT BEING CONTINUED | PAGE | OF

NAME OF OFFEROR OR CONTRACTOR

SECTION G - PRESERVATION/PACKAGING/PACKING
G. PRESERVATION, PACKAGING, PACKING AND MARKING REQUIREMENTS *(OVERHAUL)*

All specifications and standards applicable to the requirements herein shall be the issue in effect on date of invitations for bids.

NOMENCLATURE	STOCK NUMBER
Test Stand	4920-00-573-6168
	PART NUMBER 74TS1000

NET WEIGHT	SHIPPING DIMENSIONS	GROSS WEIGHT	CUBIC FEET
2020 lbs	78" x 57" x 55"	2020 lbs	143

PACKAGING [X] LEVEL A [ ] LEVEL B

[X] PACKAGING SHALL BE IN ACCORDANCE WITH SPECIFICATION MIL-P-116. THE FOLLOWING DETAILED REQUIREMENTS SHALL APPLY:

UNIT PKG QTY	METHOD	PRESERVATIVE	WRAP	DUNNAGE	CONTAINER
1	I	MIL-C-16173 Grade 2 *	MIL-B-121 Grade A **	Steel or plastic strapping ***	None

* Cover all bare, exposed & uncoated metal surfaces with P-2. Wrap preserved areas with greaseproof waterproof barrier material. Secure barrier material with PPP-T-60 tape.
[X] OTHER ** Cover all ventilation ducts & screens with barrier material tape. Secure with PPP-T-60 tape. Tape all seams & openings around doors and panels.
*** Strap draw bar in vertical position. Insulate between strapping & metal surfaces with plastic sheet, L-P-378.

PACKING [X] LEVEL A [ ] LEVEL B

[ ] a. ITEMS SHALL BE PACKED IN CONTAINERS CONFORMING TO

[ ] b. ITEMS SHALL BE PACKED IN CONTAINERS CONFORMING TO SPECIFICATION PPP-B-601 STYLE I, GRADE A.

[ ] c. PLYWOOD USED SHALL BE STANDARD GRADE WITH EXTERIOR GLUE OF GROUP B OF NN-P-530.

[ ] d. ITEMS SHALL BE PACKED IN A MANNER TO INSURE CARRIER ACCEPTANCE AND SAFE DELIVERY AT DESTINATION. CONTAINERS SHALL BE IN ACCORDANCE WITH UNIFORM FREIGHT CLASSIFICATION RULES OR REGULATIONS OF OTHER CARRIERS APPLICABLE TO THE MODE OF TRANSPORTATION.

[X] e. OTHER. Lock wheels for storage or shipment.

MARKING

[X] a. MARKING OF SHIPMENTS (1968 JUN)
THE CONTRACTOR SHALL MARK ALL SHIPMENTS UNDER THIS CONTRACT IN ACCORDANCE WITH THE EDITION OF MIL-STD-129, "MARKING FOR SHIPMENT AND STORAGE," IN EFFECT AS OF THE DATE OF THE SOLICITATION. (ASPR 7-104.68) IN ADDITION, CONTROL PART NUMBER, IF ANY, PART NUMBER, AND SERIAL NUMBER, IF ANY, SHALL BE MARKED ON THE UNIT CONTAINER.

[X] b. MATERIEL CONDITION MARKING SHALL BE APPLIED IN ACCORDANCE WITH MIL-STD-129. A MATERIEL CONDITION TAG OF THE APPLICABLE TYPE WILL BE SECURELY ATTACHED DIRECTLY TO ALL UNINSTALLED OR STORED AERONAUTICAL OR AIR DELIVERY ITEMS. WHEN SUCH ITEMS ARE PLACED OR STORED IN CARTONS, PACKAGES, CRATES OR METAL SHIPPING CONTAINERS, A DUPLICATE MATERIEL CONDITION TAG OR LABEL WILL BE SECURELY ATTACHED TO THE EXTERIOR OF THE PACKAGE OR CONTAINER IN SUCH A MANNER THAT WILL AFFORD MAXIMUM PROTECTION FROM HANDLING AND WEATHER. TAGS WILL BE COMPLETED EITHER BY TYPEWRITTEN OR PRINTED BLACK LEAD PENCIL ENTRIES. ITEMS OF A COMMON OR NONTECHNICAL NATURE *(i.e.,* COMMON HARDWARE, BULK MATERIALS, ETC.) THE SERVICEABILITY OF WHICH IS OBVIOUS, AND THE IDENTITY AND INSPECTION REQUIREMENTS ADEQUATELY INDICATED BY COMMERCIAL TAGS, LABELS OR MARKINGS, MAY BE RECEIVED, STORED, ISSUED OR SHIPPED WITHOUT MATERIEL CONDITION TAGS.

[X] c. EXTERIOR SHIPPING CONTAINERS OF SIMS *(Selected Item Management System)* MATERIEL SHALL BE MARKED WITH SIM PROJECT CODE DISC LABELS IN ACCORDANCE WITH MIL-STD-129. THE CONTRACTING OFFICER WILL PROVIDE SIM PROJECT CODE LABELS ON REQUEST. THEY ARE AVAILABLE IN TWO SIZES 3 X 3 AND 9 X 9. SPECIFY ON YOUR ORDER THE SIZE AND QUANTITY REQUIRED.

Figure 1-7. Preservation, Packing and Marking Requirements Document.

d. Hydraulic Pump. The hydraulic pump incorporates the following features; a fluid volume control providing regulation of pump delivery from 0 to 10 gpm (gallons per minute) at operating pressures ranging from 400 to 5000 psi (pounds per square inch) output, and adjustable compensating control (16, fig. 1-9) mounted on the control panel, which at the predetermined pressure, reduces pump delivery to the minimum requirements to maintain pressure in the system. The pump is protected from overheating by a preset thermoswitch mounted in the low pressure filter which stops the engine when the fluid to the pump exceeds 160 degrees F.

NOTE

For the purpose of explanation the front of the unit is considered the tow. bar end and the right and left are referenced to an operator standing at the rear of the unit and facing towards the tow bar end.

e. ***Service Hoses.*** The rear compartment of the test stand contains the service hoses and related hose accessories. This compartment is accessible through the rear end access doors (7, fig. 1-2).

f. Control Panel. A control panel access door (1, fig. 1-2) gives access to the control panel which houses the fluid high pressure gage, low pressure gage, fluid temperature gage, ammeter, engine fuel gage, engine oil gage, engine tachometer and hourmeter, high pressure filter warning light, low pressure filter warning light, fuel tank level indicator and hydraulic reservoir (fluid) level indicator. This panel is shock mounted on to the major control panel which houses the colume control, fluid flow indicator, reservoir selector valve, low pressure filter selector valve, fluid bypass valve, high pressure relief valve, flow control valve, gage shutoff valve and pressure compensator control.

g. Major Start Panel. Attached to the major control panel, the engine start panel houses the choke control, starter 'switch, engine throttle control, ignition switch and the fuse and fuse holder (fig. 1-9).

h. Engine Overhead Access Doors. The engine overhead access doors allow entry and ventilation to the engine compartment. These doors are provided with a fastening device to hold doors in a fully opened position.

i Engine Access Side Doors. The engine access side doors permit entry to the engine compartment and supply ventilation to the engine.

j. Fuel Tank Access Door. The fuel tank access door allows access to the fuel tank (15) and fuel filler spout. Mounted on the inside of the access door is a holder for storing the test stand instruction manual and related literature.

k. Housing Assembly. The housing assembly is removed by unsnapping ten fasteners and lifting from frame.

1-5. Identification Plate. The manufacturer's identification plate is located on the front of the housing assembly and specifies type, specification, contract number, National stock number, manufacturers part number, serial number, weight, towing speed, and rating of the hydraulic test stand. (Refer to fig. 1-5).

1-6. Engine Data Plate. The engine data plate. mounted on the engine air shroud inside the engine compartment, specifies the make, model, serial number and operating instructions of the engine. (Refer to fig. 1-6).

1-7. Capabilities and Limitations. The test stand is a self contained mobile testing unit, capable of delivering a continous flow of hydraulic fluid at the rate of 0 to 10 gpm (gallons per minute) at pressures from 400 to 5000 psi. The test stand is also capable of maintaining a rated output of 10 gpm at 3000 psi or 5 gpm at 5000 psi at the same time that the inlet fluid pressure to the stand is varied throughout the range of 16 inches HG absolute to 110 psig pressure. The test stand will operate efficiently within an ambient temperature range from -20 degrees F to +125 degrees F, Table 1-1 lists outstanding facts concerning test stand.

Table 1-1. Test Stand Peculiar Data

Manufacturer	Precision Laboratories, Inc.
Model	D-5C
Operating Range:	
Altitude	Sea Level to 6000 Ft
Abient Temperature	-20 Degrees F. to 120 degrees F
Humidity	0 to 100%
Deflection	8 1/2 degrees in any place from horizontal
Engine:	
Manufacturer	Wisconsin Motor Corporation
Model	MVG4D, Disp. 3 7/16 x 4, Spec. No. 38934 Net Cont. BHP 22.6 at RPM 1800
Cycle	4 Stroke
Cylinders	4
Cooling	Air
Cylinder Bore	3 7/16 inch
Stroke	4 inches
Piston Displacement	148.48 cubic inches
Horsepower	36 at 2400 RPM
Firing Order	1-3-4-2
Capacities:	
Engine Crankcase	5 Quart
Engine Fuel Tank	16 Gallons
Hydraulic Reservoir	25 Gallons
Weight	2020 lb
Height (Excluding Towbar)	55 In.
Length (Excluding Towbar)	78 1/2 In.
Width (Overall)	57 In.
Wheel Tread (Distance between center of tire)	49 In.
Wheel Base	59 In.
Tire Type	Pneumatic
Tire Size	6:00 x 9
Tire Pressure	60 psi
Max Towing Speed (Smooth Surface)	20 mph
Max Towing Speed (Rough Surface)	10 mph
Servicing Hoses	20 Ft Pressure, 20 Ft return line

1-8. **Controls and Instruments.** This section describes, locates and furnishes the operator with sufficient information pertaining to the various controls (Fig. 1-8) and instruments (Fig. 1-9) provided for proper operation of the aircraft hydraulic test stand.

a. Brake Lever Assembly. The hand brake lever assembly (7, Fig. 1-8) is mounted on the front of the frame assembly and sets the brake shoes in the rear wheels to secure the test stand in position for operation.

b. Fluid Level Indicator. The fluid level indicator (11, Fig. 1-9) is located in the upper right hand corner of the control panel. It indicates the hydraulic liquid level in the reservoir. The dial is marked E, 1/2 and F.

c. Gage Shutoff The gage shutoff valve (13, Fig. 1-9) is located in the lower left of the control panel isolates the Hi-Pressure Gage from the circuit for testing.

d. Fluid By-Pass Valve. The fluid by-pass valve (14, Fig. 1-9) is located in the lower left hand corner of the control panel. It provides a means of Unloading the pump and diverting the pump output into the reservoir or back to the pump inlet. This valve must be open, creating a zero pressure condition, while starting the engine, connecting the test stand to the aircraft under test, and while setting the outlet selector valve.

NOTE

After starting, do not use by-pass valve to control pressure. Use compensator control.

e. Choke Control. The choke control (21, Fig. 1-9) located on the engine control panel, is a manually operated control that closes the butterfly in the carburetor, enriching the fuel mixture for starting a cold engine.

f. Throttle Control. The throttle control, (22 Fig. 1-9) located on the engine control panel, is a push-pull, twist lock control used to set the governor for the desired engine RPM.

g. Ignition Switch. The ignition switch (23, Fig. 1-9) is mounted in the upper center of the engine control panel. When in OFF position, the ignition switch grounds the magneto thus stopping the engine. In the ON position, which is the engine run position, the magneto is ungrounded also, accessories are energized.

h. Starter Switch. The starter switch (24, Fig. 1-9) mounted on the engine control panel, is a spring loaded, push-typeswitch. When pressed inward it energizes the armature relay which in turn completes the electrical circuit between the battery and the starter.

i. Tachometer Hour Meter. The tach hour meter (9, Fig. 1-9) mounted on the test stand control panel, is a dual indicating instrument. The tachometer is a needle indicating, direct- reading instrument graduated from 0 to 2500 RPM in increments of 100 RPM. The tachometer indicates the engine RPM. The normal operating speed is approximately 1800 RPM. The hour meter indicates running time of the engine and is displayed digitally to the nearest 1/100 of an hour. The displayed time is the time base for all maintenance performed on the engine and test (stand filter change, oil change, periodic inspection etc.).

j. Oil Pressure Gage. The oil pressure gage (7, Fig 1-9) located on the instrument control panel, is a needle-indicating, direct-reading, pressure, actuated gage with the dial marked OFF, XX and ON. Normal oil pressure is indicated when the needle is between XX and ON ranges.

k. Ammeter. The ammeter (10, Fig. 1-9) mounted on the instrument control panel, is a needle indicating, direct-reading, electrically actuated instrument. The dial is graduated in a 60-0-60 ampere scale. The ammeter indicates the amount of current flowing to the battery. With the engine in operation, the normal reading should be on the charge side of the 0.

1. Flow Control Valve. The 1/2 inch flow control valve (17, Fig. 1-9) located on the center of the control panel, may be used to control the flow of hydraulic fluid from the hydraulic test stand.

m. Fluid Volume Control. The fluid control (18, Fig. 1-9) is located on center of the control panel. This control positions the cam plate of the pump to obtain the desired volume output. The adjusted output is indicated by the fluid flow indicator.

n. Flow Indicator. The fluid flow indicator (15, Fig. 1-9) mounted on the left of the control panel, indicates hydraulic pump delivery. The indicator dial graduated in 1/2 gallon increments from 0 to 10 gpm.

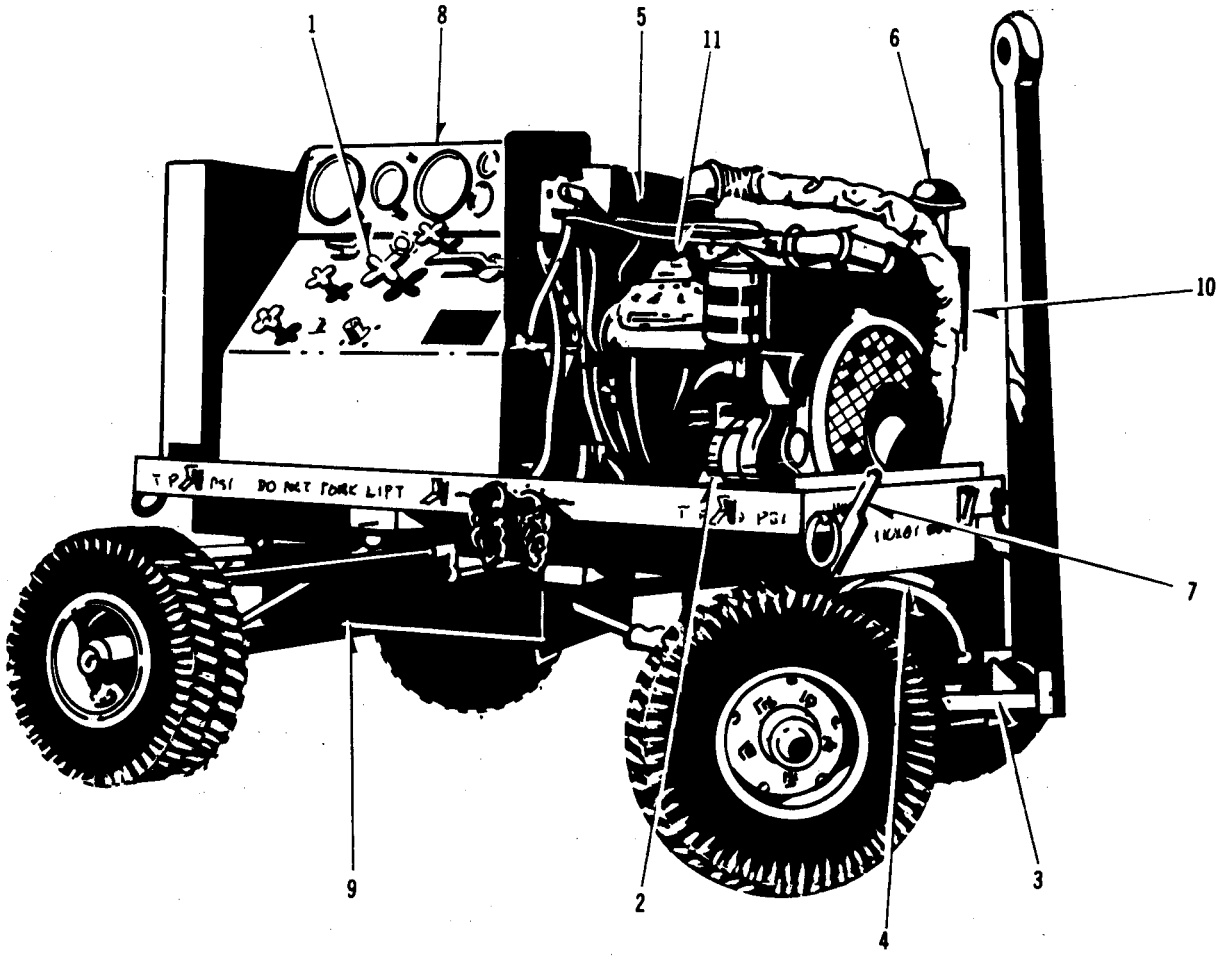
o. High Pressure Relief Valve. The high pressure relief valve (19, Fig. 1-9) located in the center of the control panel, is an adjustable by-pass type relief valve with an operating range from 400 to 5000 psi. This valve serves as a safety device, protecting the hydraulic system under test from excessive pressure.

p. Compensator Control. The compensator control (16, Fig. 1-9) located in the center of the control panel, is adjusted for the desired discharge pressure of the test stand. A locknut is provided to secure the control in adjustment.

q. Fluid Pressure Gage. The fluid pressure gage (6, Fig. 1-9) mounted on the instrument control panel, is a needle-indicating, direct-reading, pressure actuated gage. The dial is graduated from 0 to 6000 psi in increments of 100 psi. When the test stand is in operation the fluid pressure gage indicates the discharge pressure selected by the compensator control.

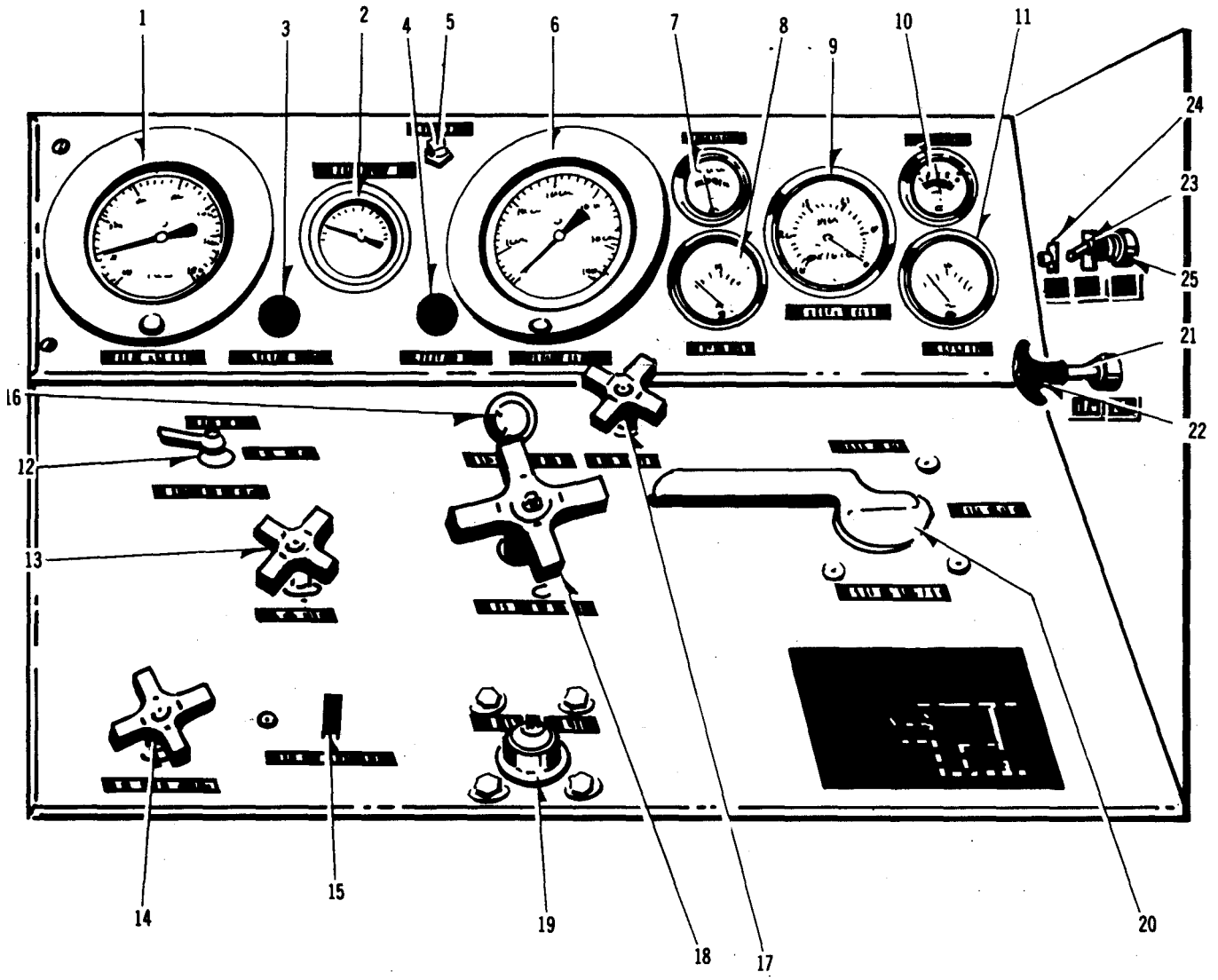
r. Gage Snubber Valve. The gage snubber valve, located below the pressure gage on the back side of the test stand control panel, is orifice type valve provided to prevent pressure surges to the fluid pressure gage.

s. Gage Test. The gage test port (5, Fig. 1-9) extending through the test stand instrument control panel, is provided for the connection of a test pressure gage to check the accuracy of the fluid pressure gage.



1. Hydraulic Control Panel
2. Alternator
3. Steering Assembly
4. Front Spring Assembly
5. Fluid Oil Reservoir
6. Air Breather
7. Brake Lever
8. Instrument Panel
9. Fuel Tank
10. Exhaust Hose Assembly
11. Engine

Figure 1-8. Hydraulic Test Stand, D-5C. Three Quarter Right Front View



1. Filter Pressure Gage
2. Fluid Temperature Gage
3. Lo-Filter Warning Light
4. Hi-Filter Warning Light
5. Gage Test
6. Fluid Pressure Gage
7. Oil Pressure Gage
8. Fuel Level Gage
9. Tach Hour Meter
10. Ammeter
11. Fluid Level Indicator
12. Filter Pressure Select Valve
14. Fluid By-Pass Valve
15. Flow Indicator
16. Pressure Compensator
17. Flow Control Valve
18. Volume Control
19. Hi-Pressure Relief
20. Return Flow Select Valve
21. Choke Control
22. Throttle Control
23. Ignition Switch
24. Starter Switch
25. Fuse

Figure 1-9. Instrument Control Panel

t. Filter Pressure Gage. The filter pressure gage (1, Fig. 1-9) mounted on the instrument control panel, is a needle-indicating, direct-reading pressure and vacuum actuated, compund-type gage. When used in conjunction with the pressure selector valve, the filter pressure gage indicates pressure drop through the low pressure filter. An indicated pressure drop of 20 psi necessitates replacement of the low pressure filter element.

u. Filter Pressure Select Valve. The pressure selector valve (12, Fig. 1-9) located directly below the filter pressure gage, is a two-way plug type valve utilized to switch the filter pressure gage connection from the inlet to the outlet side of the low pressure filter, thereby determining the condition of the filter element.

v. Return Selector Valve. The return selector valve (20, Fig. 1-9) mounted on the control panel, is a 4-way plug-type valve, providing a means of selecting return through the reservoir or return, bypassing the reservoir.

w. Fluid Temperature Gage. The fluid temperature gage (2) located at the top of the instrument control panel, is a needle-indicating direct-reading, temperature gage graduated from -40 to 200 degrees F. in increments of 2 degrees, from 100 to 200 degrees range. The gage indicates the temperature of the circulating fluid. During operation the indicated fluid temperature should never exceed 160° F.

x. Low Pressure Relief Valve. The low pressure relief valve, located between the low pressure filter inlet and the reservoir, protects the pump from excessive return pressure.

y. Hi and Low Pressure Filter Warning Lights. A low pressure filter warning light (3, Fig. 1-9) and a hi pressure filter warning light (4, Fig. 1-9) are provided to indicate requirement for filter change when actuated by their respective differential pressure switches. A “Pressure to Test” function is provided to test circuit condition.

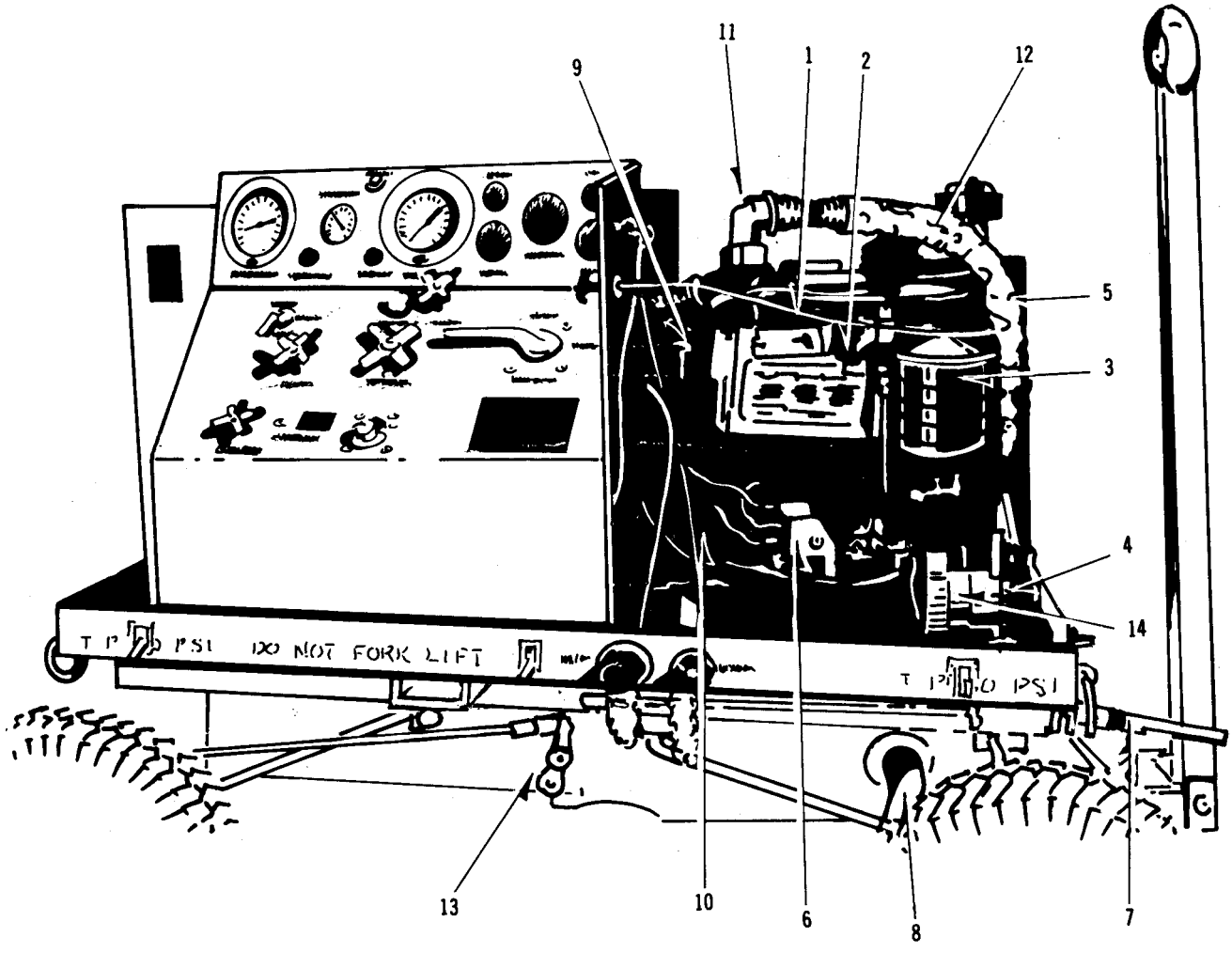
z. Fuel Level Gage. A fuel quantity level gage (8, Fig. 1-9) in conjunction with a transmitter provides an indication of available reservoir fuel.

aa. Fuse. An accessory fuse (25, Fig. 1-9) is provialed to reenergize the electrical system in the event short circuit occurs and is corrected.

ab. Engine Compartment. Engine compartment showing location of components not shown in Appendix D (Fig. 1- 10).

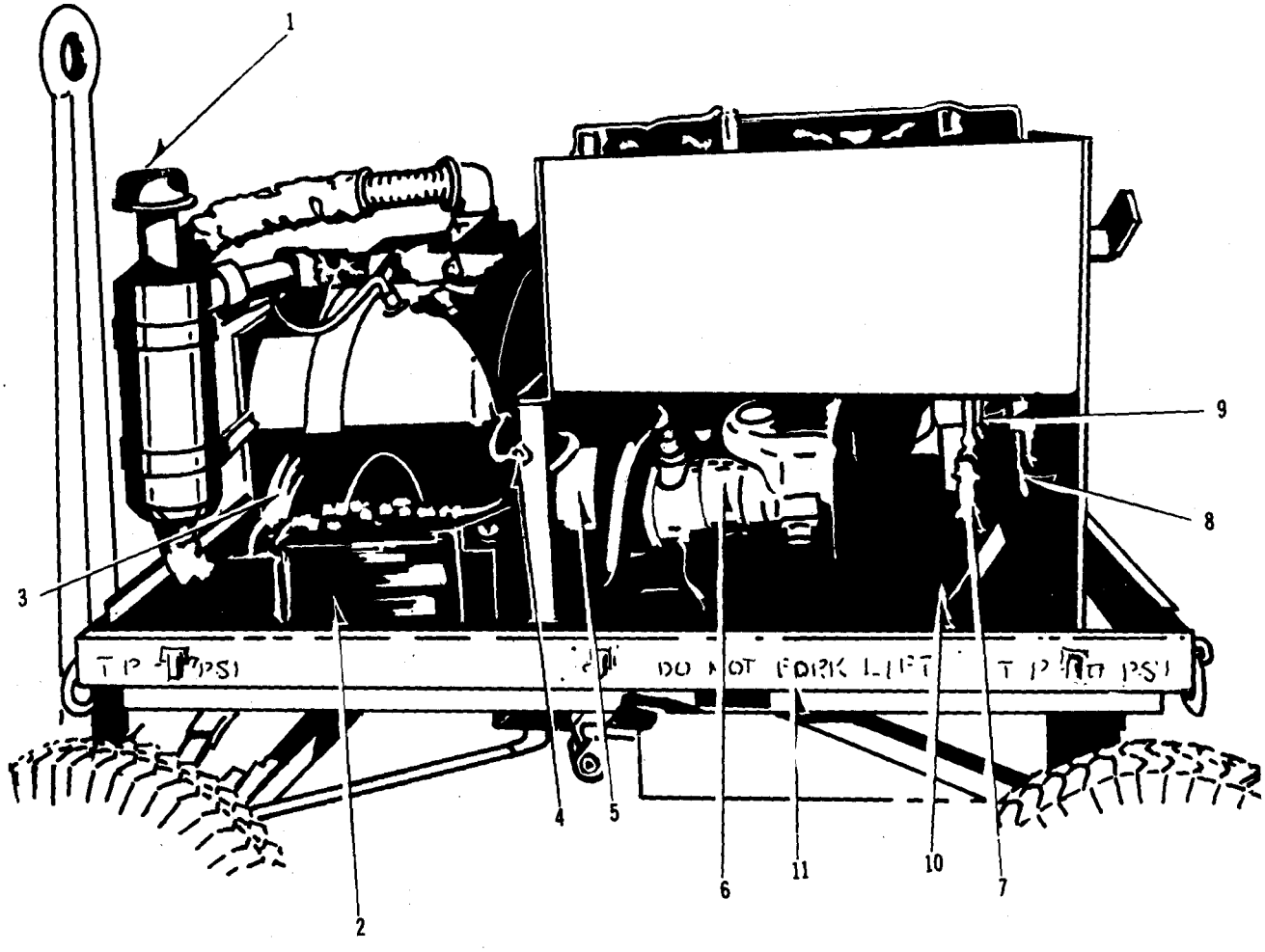
ac. Accessory Side View. Accessory Side View of test stand showing location of Battery, Aircleaner and hydraulic pump (Fig. 1- 11).

ad. Electrical Schematic. Showing relation of magneto to ignition to alternator to battery (Fig. 1-12).



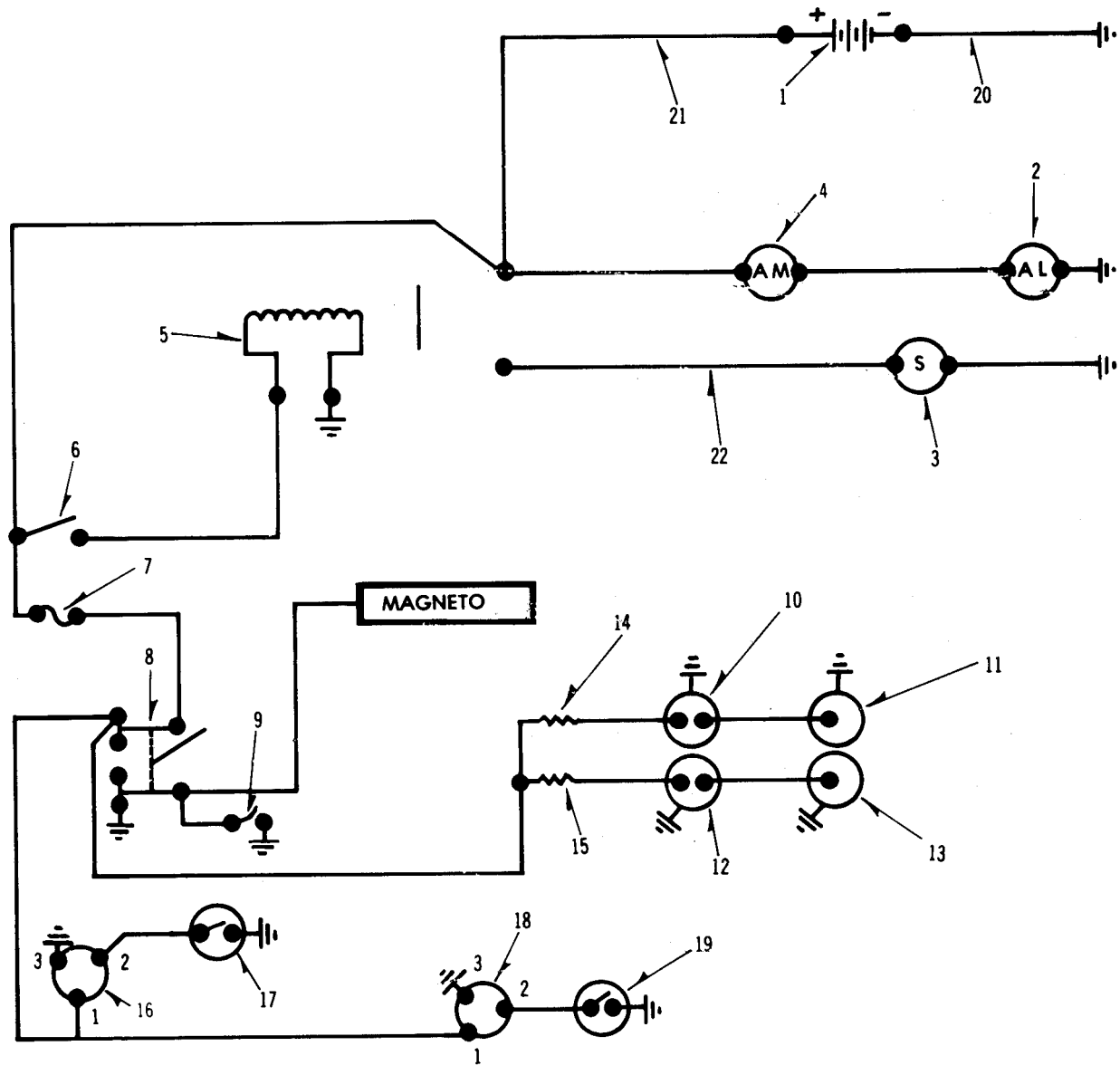
1. Engine
2. Engine Nameplate
3. Engine Oil Filter
4. Alternator
5. Exhaust Hose Assembly
6. Magneto
7. Brake Handle
8. Exhaust Muffler
9. Engine Oil Filler Cap
10. Oil Level Dip Stick
11. Elbow Connection from Engine Manifold to Flexible Steel Exhaust Hose
12. Asbestos Sleeve
13. Brake Rod Assembly
14. V-Belt

Figure 1-10. Engine Compartment



1. Air Filter
2. Battery
3. Starter
4. Starter Relay
5. Pump Mounting Adapter
6. Pump
7. Check Valve, Hi Pressure
8. Hydraulic Reservoir Drain
9. Hi Pressure Filter
10. Fuel Filler Cap
11. Lower Chassis Assembly

Figure 1-11. Hydraulic Test Stand, D-5C Left Side View



1. Battery
2. Alternator
3. Starter
4. Ammeter
5. Starter Relay
6. Switch, Start
7. Fuse (5 Amp)
8. Ignition Switch
9. Thermo Switch
10. Fuel Gage
11. Fuel Transmitter
12. Hydraulic Gage
13. Hydraulic Transmitter
14. Resistor
15. Resistor
16. Warning Lite, Low Pressure
17. Pressure Switch, Low Pressure
18. Warning Lite, High Pressure
19. Pressure Switch, High Pressure
20. Battery Cable, Ground
21. Battery Cable, Positive
22. Starter Relay Cable

Figure 1-12. Electrical Schematic

Section III. PREPARATION FOR INSTALLATION, STORAGE AND/OR SHIPMENT

1-9. Unloading. Unload test stand using the following steps:

a. Disconnect tie-down straps.

b. Where a lifting device of suitable capacity (over 3000 lb.) is available, connect cable slings to lifting eyebolts and lift the test stand from the carrier.

c. When a lifting device is not available, build a ramp with suitable lumber and tow the test stand off the carrier.

1-10. Unpacking. Remove packing from test stand as outlined in paragraphs a through d below.

a. Remove pressure sensitive tape from seams, doors, panels, screen and ventilation ducts.

b. Remove barrier material from ventilation ducts and screens.

c. Remove pressure sensitive tape from all sealed openings.

d. Use solvent specification P-D-680 for removal of preservation from exterior surfaces of the equipment.

1-11. Storage or Reshipment, Preservation. Packaging, packing and marking requirements for the test stand must be in accordance with MIL-P-116 and MILSTD 130.

1-12. Inspection of New Equipment. Inspect new equipment as follows:

a. Perform the before-operation services described in Table 3-1.

b. Make a complete visual inspection of the test stand for dents, cracks, breaks, and loose or missing parts. Make sure all components are securely mounted.

c. Inspect control panels and instruments for cracked or broken glass and damaged parts.

d. Inspect the tires for cuts, fabric breaks, and excessively worn treads.

e. Correct all deficiencies or report them to AVIM.

1-13. Servicing New Equipment. Perform the before-operation services as described in paragraph 2-1. Lubricate the test stand in accordance with Table 2-1.

a. Fuel System. Remove the fuel tank cap and fill fuel tank to capacity with the proper grade fuel, specification MIL-G-3036 or MIL-F-5572. Use clean dispensing equipment.

WARNING

Always provide a metal-to-metal contact between the container and fuel tank when filling the tank with fuel. This will prevent a spark from being generated as gasoline flows over the metal surfaces.

b. Fuel Strainer.

(1) Close the shutoff cock of the fuel strainer by turning its handle fully clockwise.

(2) Loosen the thumbnut and cup, swing the clamp wire and stud to one side and remove the glass bowl, gasket, and filter screen from the bowl cover.

(3) Wash the bowl and screen in an approved cleaning solvent item 1, Table 1-2 and wipe the bowl dry with a lint-free cloth.

(4) Install the screen, gasket, and bowl in the cover and secure with the clamp wire and the thumbnut.

(5) Open the shutoff cock and check the fuel strainer for leaks.

c. ***Battery.*** The battery of a new test stand is shipped dry charged and must be filled with electrolyte before use. Fill each cell to the level indicator of 3/8 inch over the places.

WARNING

Battery electrolyte contains sulfuric acid and can cause severe skin burns. If the electrolyte comes in contact with the body, clothing or painted surfaces, rinse immediately with clean water.

(1) Removal.

(a) Remove the negative terminal cable first, then remove the positive terminal cable from the battery.

(b) Remove the 2 hex nuts, 2 lockwashers, and 2 flat washers that secure the cover assembly and battery to the battery tray and remove the battery.

(2) Installation.

(a) Place the battery in the battery tray, mount the cover assembly on the battery and secure with the 2 flat washers, and 2 lockwashers, and 2 hex nuts.

(b) Clean all corrosion from the battery terminal adapters and terminals. Apply a thin film of grease to the terminals and adapters. Connect the positive terminal cable first then connect the negative reminal cable to the battery.

d. Hydrau!ic System.

(1) Close the drain valve. Remove the reservoir fill cap and fill the reservoir with 20 gallons of hydraulic fluid, specification MIL-H-5606. (Item 2 Table 1-2).

(2) Prime the pump in the following manner.

(a) Be certain hydraulic reservoir is full.

(b) Place selector valve in RESERVOIR position.

(c) Press vent on top of low pressure filter housing to allow all air to bleed out.

(d) Place ignition switch in the OFF position.

(e) Crank engine over 10-12 times with hand crank.

NOTE

Do not overfill the hydraulic reservoir. The expansion space in the reservoir is necessary for satisfactory test stand operation.

(3) Bleed air from the hydraulic system as described in paragraph 3-1d (2).

1-14. Inspection of Used Equipment. Inspect a used test stand as a new unit following the instructions contained in paragraph 3-1. Observe carefully the component parts that might be worn through use, such as connecting hose assemblies, tires, brakes, and drawbar assembly. Correct all deficiencies or report them to AVIM maintenance.

1-15. Servicing Used Equipment. Service a used test stand as outlined in paragraph 3-1 as a new unit. Pay particular attention to the air cleaner, oil filter, fuel strainer, battery and tires. Report all deficiencies found during sevicing to AVIM maintenance for correction.

Section IV. TEST EQUIPMENT, SPECIAL TOOLS AND MATERIALS

No test equipment, special tools or materials required.

Section V. CONSUMABLE MATERIALS

Table 1-2.

Item Number	Nomenclature	Military Specification
1	Solvent	PD 680
2	Fluid	MIL-H-5606
3	Engine Oil	MIL-L-2104
4	Engine Oil Subzero	MIL-L-10295
5	Grease	MIL-G-10924C
6	Fuel	MIL-G-3056 or MIL-F-5572

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. OPERATING UNDER USUAL CONDITIONS

2-1. Operating Under Usual Conditions. Perform the following operations:

a. Preliminary operations are as follows:

(1) Locate test stand in desired position and lock hand brake.

(2) Open all engine compartment doors and lock. (fig. 1-1 and 1-2).

NOTE

Doors must remain open while stand is in operation.

(3) Perform daily maintenance schedule in accordance with Table 3.1 and paragraph 3-1 - Operators Daily Service.

(4) Visually check engine cooling air intake screen.

b. Starting. (Normal conditions).

CAUTION

Do not couple inlet/outlet hoses until relief valve, volume and pressure compensator is set.

(1) Close flow control valve (17, fig. 1-9) and open by-pass valve (14 fig. 1-9).

(2) Adjust volume control valve (18, fig. 1-9) to minimum delivery position.

(3) Place return selector valve (20, fig. 1-9) to reservoir position.

(4) Place throttle control (22, fig. 1-9) to approximate mid position and choke (21, fig. 1-9) to full closed position.

NOTE

When starting the engine for the first time, or stand has been out of operation for a while, pump gasoline into the dry carburetor using the primer lever on the fuel pump.

(5) Place ignition switch (23, fig. 1-9) in ON position

(6) Depress starter button (24, fig. 1-9) for 3 to 4 second intervals.

NOTE

For manual start refer to paragraph 2-1e. For cold weather (below 20° F) refer to paragraph 2-1 b.

(7) When engine starts, return choke to open position and allow engine to WARM UP for approximately 5-10 minutes.

(8) As soon as engine starts check for normal oil pressure reading.

c. Operation.

(1) Pull out engine throttle to full open position and lock.

(2) Adjust hi pressure relief valve as follows:

(a) Turn pressure compensator control clockwise to the maximum pressure position (full clockwise).

(b) Open outlet valve and adjust volume control for approximately 1 gpm flow.

(3) Increase pressure by closing the by-pass valve (14, figure 1-9) until a pressure of 200/250 psi above pressure of the system to be tested indicated on gage (6, figure 1-9). Adjust relief valve setting (19, fig. 1-9) to test pressure below system pressure. Then raise relief valve setting slowly until a reading of 150/200 psi above system test pressure is indicated.

(4) Open by-pass valve (14, fig. 1-9).

d. Adjust Compensator. Adust compensator (16, fig. 1-9) as follows:

(1) Adjust volume control valve (18, fig. 1-9) for delivery requirement (GPM) of system to be tested.

(2) Slowly close by-pass valve (14, fig. 1-9) until the desired system test pressure is observed on gage (6, fig. 1-9).

(3) Turn compensator control (counter-clockwise for pressure decrease, clockwise for pressure increase) until a pressure drop is observed on the gage. Gradually turn compensator control (16, fig. 1-9) until the system pressure is again indicated.

(4) Open by-pass valve and close outlet valve.

(5) Couple inlet and outlet hoses to fittings (3 and 4, fig. 1-2) and to system being tested. Open outlet valve and close by-pass valve. The pump will now provide a constant pressure with a variable delivery as required by the system up to the pre-set volume.

e. Manual Start.

(1) Perform operations for normal electrical star . Refer to paragraph 2-lb (1) thru (8).

(2) With hand crank (3, fig. 1-3) turn engine thru 1-2 revolutions. Push choke (21, fig. 19) in approximately halfway and then pull up crank briskly. (Do not attempt to spin the engine). Repeat as necessary. If flooding should occur push choke in fully and continue cranking.

f. Cold Weather Start. (-65° F. to -25° F.)

(1) Apply starting aids, such as engine covers, hot air source, 24 volt auxiliary battery, spray can ether etc:

(2) Follow instructions for starting under normal conditions. Refer to paragraph 2-1b.

CAUTION

Do not disconnect governor or attempt to race the engine to speed up warm up process. This is extremely dangerous under any conditions.

g. Stopping the Engine.

(1) Remove load and turn ignition (23) switch to OFF.

(2) If engine has been running hard and is hot, do not abruptly stop it at full load but remove the load and allow the engine to idle for approximately 5-10 minutes.

(3) In the event a "dieseling" effect occurs (engine continues to run with ignition off), rapidly open throttle while turning ignition off. The engine will stop.

Section II. OPERATING UNDER UNUSUAL CONDITIONS

***2-2.* Operating Under Unusual Conditions.** Instructions outlined below are applicable to the respective conditions described.

a. Operating in extreme cold.

(1) Change to the engine oil specified in Table 2-1 for extreme cold.

(2) Keep the electrolyte at the proper level in the battery, and the battery fully charged. If water is added to the battery, run the engine long enough to thoroughly charge the battery.

(3) Close engine compartment doors as required to maintain satisfactory engine operating temperature.

(4) Remove oil from the air cleaner and replace with proper grade of oil per instructions on air cleaner housing.

b. Operating in Extreme Heat.

(1) Locate the test stand in a well ventilated area and keep all door assemblies OPEN during operation. (fig. 4-9).

(2) Lubricate the test stand in accordance with Table 2-1.

(3) Keep the engine shrouding, cylinder heads, fins, and the air opening in the housing free of dirt and obstructions.

c. Operating in Dusty or Sandy Areas.

(1) Lubricate the test stand in accordance with Table 2-1. Keep lubricants, grease gun, oil containers, and fittings clean.

(2) Protect the test stand from dust and sand as much as possible. Keep the unit clean and free of foreign matter.

(3) Cover the unit with a tarpaulin when not in use.

(4) If possible, wet down the area surrounding the oeration side to keep down dust and sand.

(5) Service the engine air cleaner daily.

d. Operating Under Rainy or Humid Conditions.

(1) Lubricate the test stand in accordance with Table 2-1.

(2) Keep the fuel tank full to prevent accumulation of condensation.

(3) Keep electrical components clean and dry.

(4) Cover the test stand with a tarpaulin or similar protection when not in use.

e. Operating on Salt Water Areas.

(1) Lubricate the test stand in accordance with Table 2-1.

(2) Wipe all exposed areas frequently. Clean off salt water deposits with clear water and wipe dry.

(3) Coat all exposed machine metal surfaces with a thin film of oil.

(4) Retouch or repaint damaged paint surfaces to prevent corrosion of exposed metal.

Table 2-1. Lubrication Chart

LUBRICANTS	EXPECTED TEMPERATURES			CHANGE INTERVALS
	Above +32° F	+40° F to -10° F	-10° F to -65° F	
SAE 30 - MIL-L-2104	SAE30			50 Hours
SAE 10 - MIL-L-2104		SAE 10	Eng. Oil	50 Hours
SUB ZERO - MIL-L-10295			SUB ZERO SAE-5WT	AS REQUIRED
2190 LUBRICATION OIL (General Purpose)				50 Hours
Drawbar Assembly				100 Hours
Door Hinges and Latches	2190	2110	2075	
GAA GREASE, (Automotive and Artillery)				
Wheel Bearings				100 Hours
Brake Tie Rod Ends		ALL TEMPERATURES	100 Hours	
Spring Shackels				
Wheel Spindles				100 Hours

CHAPTER 3

AVIATION UNIT MAINTENANCE INSTRUCTIONS

Section I. PREPARATION FOR INSTALLATION STORAGE OR SHIPMENT

Information for preparation for installation storage and shipment are contained in Chapter 1, Section III.

Section II. INSTALLATION

Not Applicable.

Section III. INSPECTION AND SERVICING

3-1. Operators must perform the following inspections and servicing daily as specified in Table 3-1 below.

Table 3-1. Operator's Daily Services

INTERVALS			PROCEDURES
Before Operation	During Operation	After Operation	
X	---	X	**Visual Inspection.** Make a general inspection of the entire unit for obvious deficiencies, such as oil or fuel leaks, loose or missing bolts, nuts, screws, loose connections, broken wires, and any damage that may have occured since the equipment was last operated. Correct or report any deficiencies to AVIM maintenance.
X	---	---	**Tampering.** Inspect the test stand for evidence of tampering or damage. Do not operate the unit until all defects are corrected or reported to AVIM.
X	---	X	Fuel. Check the fuel supply. See that the fuel tank is full.
X	---	X	**Leaks.** Inspect for leaks, paying particular attention to the fuel line and connections. Correct all deficiencies noticed or report to AWIM.

INTERVALS			PROCEDURES
Before Operation	During Operation	After Operation	
X	---	X	**Oil.** Check the oil level in the engine crankcase. Add oil if the oil is not at the proper level.
X	---	---	**Air Cleaner.** Inspect the air cleaner for accumulated dirt. Clean if necessary.
X	---	X	**Battery.** Clean the battery and see that the terminal connections are tight. Check the level of the electrolyte. Add water as necessary to bring the level to full indicator.
X	---	X	**Tires.** Inspect the tires for cuts, leaks, fabric breaks, and uneven wear. Check the tires for proper inflation. Correct tire pressure is 60 psi. Report defective tires to AVIM.
X	---	X	**Cooling System.** Inspect the condition of the fins on the engine. See that they are clean and free from dust and dirt. Inspect the engine shrouding for correct installation and loose or missing mounting bolts. Correct all deficiencies or report them to AVIM.
X	---	---	**Fuel Strainer.** Inspect the bowl of the strainer for accumulation of water, dirt, and foreign matter. Clean the fuel strainer if necessary.
X	---	---	**Instruments.** Inspect all instruments for broken glass, improper operation, and insecure mounting. Report all deficiencies to AVIM.
X	---	X	**Hydraulic Fluid.** Check and refill to proper level.
X	---	---	**Low Pressure and High Pressure Warning Lights.** Press to test with ignition switch on.

3-2. Lubrication. This section contains lubrication instructions which are supplemental to and are not specifically covered in the lubrication chart.

(1) Detailed Lubrication Information.

(a) Care of Lubricants. Replace covers on lubricant containers after use and store in a clean, dry place. Keep all containers, used in handling lubricating oil or gasoline clean and ready for use.

(b) Cleaning. Use an approved cleaning solvent to wipe all surfaces clean surrounding the point of application before applying the lubricant.

(c) Points of Application. Follow the detailed lubrication instructions given in the applicable maintenance paragraphs and refer to the lubrication chart for type of lubricant and interval of application.

(d) Operation After Lubrication. Operate the test stand for 5 minutes immediately after lubrication. Inspect the oil filter for

leaks and correct as necessary. Stop the unit, wait 5 minutes, and check the oil level. Add oil to bring the oil level up to the FULL mark if necessary.

(2) Oil Filter.

(a) Loosen the bolt and remove the cover from the oil filter.

(b) Remove the cartridge from inside the filter and discard.

(c) Wipe the inside of the filter with a lint free cloth making sure all dirt and sludge are removed.

(d) Insert a new cartridge in the filter body. Be sure the correct end of the cartridge is up.

(e) Install a new gasket in the cover. Place the cover on the oil filter and tighten the bolt.

(f) Add one quart of oil to the engine crankcase to compensate for oil lost in servicing the oil filter. Refer to lubrication chart Table 1-2 for the proper grade of oil.

(g) Operate the unit immediately after servicing and check for oil leaks.

b. Air Cleaner.

(1) Remove the air intake cap.

(2) Loosen the thumbscrew and remove the oil cup from the air cleaner assembly.

(3) Discard the oil cup. Wash the oil cup and air intake in an approved P-D-680 cleaning solvent and dry thoroughly.

(4) Fill the oil cup to the level mark with clean oil of the proper grade. Refer to instructions on side of cup per paragraph 2-2a (4). Install the oil cup on the air cleaner body and tighten the thumbscrew to secure.

(5) Install the air intake cap on the top of the air cleaner assembly.

c. Hydraulic System. The hydraulic system of the test stand must, at all times, be free of leaks. The efficiency of the test stand will be impaired if a leak exists anywhere in the system.

(1) Component Removal. In the event that a component in the hydraulic system is removed, all openings must be capped or plugged to prevent entrance of foreign matter to the system.

(2) Bleeding Air From the Hydraulic System.

(a) Fill the reservoir with MIL-H-5606 fluid.

(b) Open by-pass valve and allow air to escape from the pressure filter. Close bleed valve when air bubbles no longer appear close by-pass valve. Place selector valve in RESERVOIR position.

(c) Connect the 1/2 inch hose assembly to the coupling half.

(d) Open the flow control valve.

(e) Remove the reservoir fill cap. Remove the coupling half from the opposite end of the attached 1/2 inch hose assembly and insert the open end into the reservoir being careful not to damage the screen in the filler neck of the reservoir.

(f) Set the fluid volume control at 2 GPM as registered on the fluid flow indicator.

(g) Start the test stand and circulate hydraulic fluid through the system and back into the reservoir until all traces of air bubbles are gone from the fluid flowing into the reservoir.

(h) Stop the test stand and disconnect the hose assembly. Cap both ends of the hose assembly and the coupling half on the test stand.

d. Hydraulic Filter Element Replacement - LOW Pressure. The high pressure filter and the low pressure filter are protected with differential pressure switches which, when the pressure drop across the filter reaches a valve at which change of the filter element is required, illuminates a red warning light on the control panel.

CAUTION

After every replacement of the low pressure filter element, the hydraulic system must be bled of air.

(1) Remove housing cover from stand per paragraph 1-4k.

(2) Place selector valve in RETURN position.

(3) Drain approximately one quart of oil fluid from filter housing.

(4) Remove 1/4 - 20 screws from top of low pressure filter housing - remove cover.

(5) Remove old element from housing. Install new element.

(6) Replace cover on filter housing.

e. Hydraulic Filter Element Replacement - High Pressure.

(1) Open fuel tank access door on side of stand.

(2) Place drain pan under high pressure filter housing.

(3) Remove lower part of filter housing with a strap or filter wrench.

(4) Pull old element down from housing until it unsnaps.

(5) Insert new element into housing with open end up. Press upward on element until it snaps into position and supports itself.

(6) Replace lower part of filter housing with a strap or filter wrench.

(7) Place selective valve in RESERVOIR position.

(8) Open by-pass valve.

(9) Start test stand. Set compensator to 2 gpm for two (2) minutes to purge air from filter.

f. Hose Assemblies.

(1) Remove high pressure hose between the pump outlet and the check valve. Drain fluid into container when disconnecting the hose.

(2) Remove the two (2) hose assemblies attached to the two coupling haves. (fig. 4-8). These hose assemblies are stored in the compartment at the rear of the test stand when not in use. (fig. 1-3).

(3) Clean the hose assemblies in an approved cleaning solvent and dry thoroughly.

(4) Inspect the hose assemblies for frayed or worn hose. Inspect the fittings of the hose assemblies and the drain assembly for damaged threads. Replace a defective hose assembly or drain assembly.

(5) Pressure test hoses to required pressures 400 psi to 5000 psi per a reliable test stand, no leaks allowable.

g. Testing Pressure Gages.

(1) Connect a pressure gage of known accuracy to the high pressure gage test port.

(2) Start the test stand and compare the readings of both the test gage and the high pressure gage. Readjust the stand gage or replace if necessary.

h. Hydraulic Fluid Overheat Thermoswitch.

(1) Set switch at 100° F.

(2) Rotate dial right to 140 degrees then start stand per procedure paragraph 2-1.

(3) Set pressure at 3000 psi with flow at 10 GPM, then open by-pass valve until pressure drops to 2000 psi.

(4) Monitor temperature gage (2, fig. 1-9) closely, when temperature reaches 158 degrees F slowly rotate dial on temperature control (2 fig. 1-9) until engine stops 162° F.

NOTE

This method is used to coordinate temperature control with temperature gage an instrument control panel.

Section IV. PREVENTIVE MAINTENANCE

To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure, The necessary preventive maintenance services will be performed before operation. Defects discovered during operation of the unit will be noted for future correction to be made as soon as operation has ceased.

Section V. TROUBLESHOOTING

3-3. Troubleshooting. This section provides information useful in diagnosis and correction, inspection, operation, or failure of the hydrau - lic test stand, or any of its components. Each trouble symptom stated in Table 3-2, is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

Table 3-2. Troubleshooting

Probable Cause	*Possible Remedy*
Engine hard to start or fails to start.	
Carburetor not choked sufficiently	Pull choke control further out.
Carburetor flooded	Push in choke control and crank until engine fires.
Water or dirt in fuel strainer	Clean the fuel strainer, evaluate.
Battery cables loose or terminals corroded	Tighten battery cable connections or remove and clean cables as required.
Spark plugs wet or dirty	Clean or replace.
Engine misses or runs erratically.	
Water, dirt, or gum in the fuel	Clean the fuel strainer, if contaminated drain fuel tank and fill with clean fuel.
Air cleaner clogged	Service air cleaner
Carburetor out of adjustment	Report to AVIM.
Engine stops suddenly.	
Water or dirt in fuel strainer	Clean the fuel strainer, evaluate and drain fuel tank and fill with clean fuel if necessary.
Air cleaner clogged	Service air cleaner.
Hydraulic fluid temperature above 160° F	Recalibrate thermoswitch. (paragraph 3-2h
Fuel tank empty	Fill tank.
Engine Overheats.	
Crankcase oil level too low	Stop engine and add oil to proper level.
Air shroud loose or damaged	Tighten air shroud. Report damaged shroud to AVIM.
Cylinder cooling fins clogged with dirt	Report malfunction to AVIM.
Engine knocks or develops excessive Noise.	
Crankcase oil level too low	Stop engine and add oil to proper level. Refer to lubrication chart.
Engine Oil Pressure Low.	
Crankcase oil level too low	Stop engine and add oil to proper level. Refer to lubrication chart.
Oil pressure gage defective	Report malfunction to AVIM.
Engine Exhaust Smoky.	
Crankcase oil level too high	Drain off excess oil to correct level.
Carburetor choked excessively	Push in choke control.

Table 3-2. Troubleshooting (Con't)

Probable Cause	*Possible Remedy*
Engine cold causing poor combustion	Allow sufficient time for engine warm up before operating the hydraulic system.
Fuel Consumption excessive.	
Choke control partially closed	Open choke control.
Dirty air cleaner	Service air cleaner.
Fuel leaks	Report to AVIM.
Battery needs frequent recharging.	Defective Alternator, report to AVIM.
Battery electrolyte level low	Add battery water to correct level.
Battery defective	Replace defective battery.
Hydraulic pump fails to deliver sufficient pressure	
High pressure relief valve out of adjustment.	Adjust the high pressure valve.
Compensator control incorrectly adjusted	Adjust the compensator control.
Fluid by-pass valve open	Close the fluid by-pass valve.
Defective fluid pressure gage	Report to AVIM.
Loss of prime	Fill prime port of pump.
Hydraulic pump fails to deliver sufficient volume.	
Fluid volume control incorrectly adjusted	Adjust the fluid control.
Engine speed incorrect	Check throttle for pre-set stare position.
Air in hydraulic system	Bleed air from hydraulic system.
Hydraulic system pressure too high.	
High pressure relief valve set too high	Adjust high pressure relief valve.
High pressure relief valve defective	Refer the malfunction to AVIM.
Hydraulic fluid temperature too high.	Allow fluid to cool.
Low pressure filter dirty	Report deficiency to AVIM.
Defective temperature gage	Replace gage.
Reservoir fluid level low	Fill reservoir to correct level.
Defective thermoswitch	Adjust or replace thermoswitch.
Compensator pressure setting higher than relief valve pressure setting	Adjust relief valve setting to a valve of 150 to 200 psi higher than the compensator setting.

CHAPTER 4

AVIATION UNIT AND INTERMEDIATE MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE

4-1. General. Preventive maintenance is performed by AVIM personnel at 50 and 100 hour intervals. The preventive maintenance services to be performed at these regular intervals are listed in Table 4-1. The first column headed "Inspection" is provided for the in formation of the person performing the inspection. An "X" in this column indicates that an inspection should be made of the listed items in accordance with instructions. The indicated items and instructions constitute minimum inspection requirements for the equipment.

4-2. Aviation Unit and Intermediate Preventive Maintenance Authorized Services.

Table 4-1. Aviation Unit and Intermediate Preventiue Maintenance Services (Refer to Appendix D)

INSPECTION	50 HOUR	100 HOUR	GENERAL
X	X	X	Before operation service. Perform the services listed in "Daily Before Operation Services" Table 3-1, Chapter 3, Section III.
X	X	X	Lubrication. Inspect for missing or damaged lubrication fittings and inspect for indications of improper lubrication. Inspect lubricant level in engine crankcase. Inspect for oil and grease leaks; also inspect for defective or damaged oil seals.
	X	X	Lubricate as necessary in accordance with Table 2-1. Replace missing or damaged fittings. Correct all oil or grease leaks.

INSPECTION	50 HOUR	100 HOUR	GENERAL
			Appearance. Inspect the general appearance of the equipment, paying particular attention to cleanliness, legibility of identification markings, and conditions of the paint. Correct all deficiencies noticed.
X	X	X	Cylinder head, manifold, and muffler. Inspect the cylinder heads, manifolds and muffler for leaks, loose mounting and defective gaskets. Tighten loose manifolds and muffler mounting bolts and nuts. During the first weekly servicing of a new or reconditioned engine, inspect all the cylinder head bolts for tightness. After warming the engine up to operating temperature, tighten any loose bolts to 25 to 32 ft.-lb torque. Replace defective cylinder head and manifold gaskets.
X	X	X	Valve Mechanism. If the valves are noisy or loss of power is noticed, inspect the condition of the valve mechanism.
X	X	X	Remove valve covers and adjust valve lifter clearance if necessary. The correct clearance for the valve lifters is 0.0080 inch for the intake valves and 0.0160 inch for the exhaust valves. Replace cover gaskets if defective.
X		X	Compression Test. Remove the spark plugs and test the cylinder compression by turning the engine ocver serveral times to stabilize gage reading. If the gage reading varies more than 10 pounds between the four cylinders, inspect the cylinder head bolts for tightness.
X		X	Tighten any loose bolts and retest. If low compression or a variation in compression persists the trouble lies with the cylinder head gasket, valves, or piston rings. Correct all deficiencies.
X	X	X	Electrical System Magneto. Inspect the ignition magneto for loose mounting bolts and wiring connections. Correct any deficiencies notes.
	X	X	Remove the end cap and inspect the distributor cap for cracks, and corroded terminals. Examine the breaker point gap. The correct gap is 0.015 inch at full separation of points.

INSPECTION	50 HOUR	100 HOUR	GENERAL
X	X	X	Spark Plug. Inspect the spark plugs for looseness, bad connections, and dirty or broken insulators.
	X	X	Replace damaged spark plug. Clean dirty plugs and set the gap to 0.030 inch.
X	X	X	Alternator and Starter. Inspect the mounting of the alternator and starting motor for loose connections. Examine the brushes, brush holders and springs. Inspect the commutators for dirt and scoring.
	X	X	Tighten loose mounting bolts. Replace brushes worn to one half their original length.
X	X	X	Alternator. The alternator regulator should allow an appreciable charge to go into the battery after the starter is used. After the battery is fully charged, the ammeter should read only a slight charge. Replace a defective alternator regulator.
			INSTRUMENT AND CONTROL PANEL
X	X	X	Gages. Examine the condition of all gages. See that all gages indicate correctly and that the flass is not cracked or broken. (figure 4-2).
	X	X	Tighten loose mounting screws and connections. Replace any defective or damaged gage.
			Meters. Seethat all meters are securely mounted and operating properly and that the glass is not cracked or the indicators are not bent or broken.
			Tighten loose mounting screws and replace and defective or damaged meter.

INSPECTION	50 HOUR	100 HOUR	GENERAL
			Control Valves. Inspect all control valves for packing leaks and proper operation. See that control valve handles are securly attached. (fig. 4-3).
	X	X	Tighten packing nut or replace as required. Replace a defective or damaged control valve.
			RUNNING GEAR
X	X	X	Tires. Inspect all tires for under inflation, abnormal of uneven wear, cuts, embedded foreign matter and missing valve caps.
	X	X	Remove any foreign matter from tires. See that tires are inflated to correct pressure and all valve capsare in place.
X	X	X	Wheels. Inspect for loose wheel mounting bolts. Inspect wheel bearings for proper adjustment and lubrication.
	X	X	Tighten loose wheel bolts and adjustwheel bearings as required.
X	X	X	Axles. Inspect the axle assemblies for secure mounting and proper alignment. Inspect the springs for cracks, breaks and weakened condition.
	X	X	Tighten all axle mounting bolts. Align the front wheels as required. Replace defective springs.
X	X	X	Brake Assembly. Inspect the brake assembly for correct adjustment. Inspect the linkages for secure mounting.
	X	X	Tighten all brake assembly mounting bolts and adjust the brakes.
			HYDRAULIC SYSTEM
X	X	X	Hydraulic Pump. Inspect the hydraulic pump for loose mounting bolts and hydraulic connections. See that the drive coupling is securely mounted and aligned.

INSPECTION	50 HOUR	100 HOUR	GENERAL
	X	X	Tighten all mounting bolts and loose or leaking connections. Replace a defective drive coupling.
X	X	X	Hose Assemblies. Inspect the hydraulic hose assemblies for loose connections. Inspect the hose for cracks, breaks, and for frayed or rotten fabric covering, pressure test (per paragraph 3-1 b(5).
	X	X	Tighten hose connections andreplace any defective hose assembly.
X	X	X	Tubing. Inspectall tubing for cracks, breaks, distortion and leaks.
	X	X	Tighten all tube connections. Replace any damaged or defective tube or fitting.
X	X	X	High Pressure Filter Assembly. Inspect the filter for dirty or clogged condition resulting in excessive pressure drop.
		X	Remove and replace the filter element.
X	X	X	Thermoswitch. Inspect the thermoswitch for correct temperature response and for secure installation. Replace a defective, inoperative or damaged thermoswitch. Adjust thermoswitch per paragraph 3-1h. if necessary.

Section II. TROUBLESHOOTING

This section provides information useful in diagnosis and correction, inspection, operation, or failure of the hydraulic test stand, or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

Table 4-2. Troubleshooting

Engine hard to start or fails to start.

Probable Cause	*Possible Remedy*
Battery defective	Charge or replace defective battery.
Choking insufficient	Inspect the choke valve for full open or closed position.
Battery cables loose on terminals.	Tighten loose connections.

Ignition switch faulty	Replace switch.
Battery cable loose on armature relay	Tighten loose connections.
Carburetor flooded	Remove spark plugs and crank the engine several times to drive out rich fuel mixture.
No ignition spark	Test the spark.
Spark plug defective	Clean and adjust or replace spark plug.
Magneto faulty	Repair or replace magneto contact point set.

Engine misses or runs erratically.

Carburetor gasket leaks	Tighten carburetor mounting bolts. Replace gaskets if leak persists.
Spark Plug	Test spark, clean or replace if necessary.
Ignition wiring loose	Tighten ignition wire connections.
Spark gap incorrect	Measure and reset spark plug gap.
Magneto contact points pitted or incorrectly adjusted	Clean, adjust, or replace contact points.
Governor defective	Repair governor.

Engine stops suddenly.

Fuel pump defective	Repair or replace fuel pump.
Fuel line clogged	Remove and clean fuel line, replace if defective,
Magneto contact set defective	Replace defective contact set.
Hydraulic fluid temperature excessive	Allow fluid to cool.

Engine overheats.

Cylinder cooling fins dirty	Clean dust and dirt from cooling fins.
Magneto timed late	Time the magneto.
Air shroud partially removed from engine	Install the missing shroud.

Engine knocks or develops excessive noise.

Magneto timing advanced too far	Time the magneto.
Carbon deposits on cylinder heads	Remove and clean cylinder heads.

Flywheel loose	Tighten the flywheel.

Engine exhaust smoky.

Carburetor incorrectly adjusted	Adjust the carburetor.
Carburetor defective	Repair or replace carburetor.

Engine starter fails to operate.

Ignition fuse blown	Replace ignition fuse.
Starter brushes worn	Replace brushes.
Electrical connections loose or corroded	Tighten connections or replace wiring.
Starter switch contacts burned	Replace starter switch.
Starter brushes defective	Replace starter brushes.

Fuel consumption excessive.

Carburetor incorrectly adjusted	Adjust the carburetor.
Fuel tank leaking	Repair or replace fuel tank.
Carburetor defective	Repair or replace carburetor.

Ammeter shows no charge or discharge with engine operating.

Electrical connections loose or corroded	Clean and tighten electrical connections.
Alternator regulator faulty	Replace alternator.
Alternator V-belt loose or broken	Adjust or replace V-belt.
Alternator inoperative	Replace worn brushes or alternator
Ammeter defective	Replace ammeter.

Ammeter shows excessive charge.

Battery run down	Charge battery.
Alternator regulator defective	Replace alternator.
Alternator field winding grounded	Replace alternator.

Ammeter needle fluctuates rapidly.	
Electrical connections shorted or loose	Repair short circuits and tighten loose connections
Wheel wobbles	
Wheel bent	Replace the wheel.
Wheel loose on the hub	Tighten wheel mounting bolts.
Wheel bearings incorrectly adjusted	Adjust wheel bearings.
Wheel bearings overheat.	
Wheel bearings lack lubrication	Lubricate wheel bearings.
Wheel bearings incorrectly adjusted	Adjust wheel bearings.
Linkage move sluggishly.	
All grease fittings dry spring shackles stiff	Lubricate all purpose grease fittings.
Tire wear abnormal or uneven.	
Wheel loose on the hub	Tighten wheel mounting bolts.
Steering tie rod incorrectly adjusted	Adjust tie rods.
Brake does not hold.	
Normal wear	Adjust brakes.
Defective brake assembly	Repair or replace brake assembly.
Hydraulic pump fails to deliver sufficient pressure.	
Defective high pressure relief valve.	Repair or replace high pressure relief valve.
Fluid pressure gage defective	Replace fluid pressure gage.
Compensator control defective	Repair or replace compensator control.
Hydraulic pump defective	Replace the pump.
Loss of prime	Fill prime port on pump.

Hydraulic pump fails to deliver sufficient volume.

Fluid volume control defective	Repair fluid volume control.
Air in the hydraulic system	Bleed air from the system.
Engine speed too low	Check engine with hand speed indicator. Replace tachmoeter if defective.
Fluid flow indicator defective	Replace or repair fluid flow indicator.
High pressure filter clogged	Replace high pressure filter.
Fluid by-pass valve leaking	Replace fluid by-pass valve,

Hydraulic system pressure too high.

High pressure relief valve defective	Repair or replace high pressure relief valve.
Compensator control defective	Repair or replace compensator control.
Fluid pressure gage defective	Repair or replace fluid pressure gage.

Hydraulic Fluid Temperature too high.

Fluid temperature gage defective	Replace fluid temperature gage.
Filter pressure filter clogged	Replace high pressure filter.
Thermoswitch defective	Adjust or replace the thermoswitch.
Compensator pressure switch set higher than relief valve pressure setting	Adjust relief valve to a setting 150 to 200 psi higher than compensator setting.

Section III. RADIO INTERFERENCE SUPPRESSION

4-3. Definition. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the test stand and which may interfere with the proper operation of radio receivers or other electronic equipment. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the test stand.

4-4. Purpose of Interference Suppression. The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbance generated by the test stand are composed partly of electrical waves in the radio frequency range they must be suppressed for two important reasons. First, they will interfere with the proper operation of the friendly radio set, and second, they will enable the enemy to locate the equipment and its associated units.

4-5. General Sources of Interference. Generally radio interference is generated anywhere a spark occurs or where a high-frequency current is present. A spark is a small amount of current jumping an air gap in response to the force of a relatively high voltage. The gasoline engine ignition system is a common source. Magneto breaker points, relay contacts, and static changes collecting on the frame are other common sources which in some way must be suppressed.

4-6. General Methods used to Attain Proper Suppression. Essentially, suppression is-attained by providing a low-resistance path to ground for the stray currents. The method used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps if required. When a low or no charging rate is indicated, inspect for loose connections, frayed or damaged wires, defective battery or ammeter. If none of these conditions exist, repair or replace the alternator and/or regulator.

Section IV. ENGINE MAINTENANCE INSTRUCTIONS

4-7. Engine Accessories. The engine accessoriesconsist of the ignition magneto, electrical engine starter, and alternator with an integral regulator. For detailed maintenance instructions see Appendix D.

a. Magneto. The magneto is a flange-mounted type, A permanent magnet, mounted on the rotor shaft produces a high voltage current as its field passes through a fixed coil. The current produced is fed to the spark plugs at the proper instant by a distributor.

b. Electrical Engine Starter. The electrical engine starter is a 24-volt, 4 brush, bendix drive type. The starter converts electrical energy from the battery into mechanical power and transmits this power to the engine flywheel for electrical starting.

Cleaning and Inspection.

(1) Clean the external surfaces of the starter with a cloth dampened in an approved cleaning solvent and dry thoroughly. Clean corrosion from the electrical terminal of the starter.

(2) Inspect the terminal of the starter for corrosion and damaged threads.

(3) Remove the brush access cover and inspect the starter internally for damage. Inspect the brushes for oil soaked condition and excessive wear. If the brushes are less than half their original length replace the brushes. Refer a defective starter to AVIM for overhaul.

c. ***Alternator.*** The engine accessory alternator is a V-belt driven one wire system unit, with a built in circuit regulator that can provide up to 40 amps at 24 volts, for supplying current to the 24 volt test stand battery.

Cleaning, Inspection and Repair.

(1) Clean the outside of the alternator with a cloth dampened with an approved cleaning solvent

and dry thoroughly. Clean all other metal parts in an approved solvent and dry with a lint-free cloth.

(2) Inspect the terminal studs for corrosion. Remove all corrosion and apply a thin film of grease.

(3) Inspect the brushes. Replace brushes that are oil soaked or worn or less than half their original length.

(4) Inspect the pulley and fan for cracks, breaks, and distortion. Straighten a bent or distorted pulley and fan. Replace a pulley or fan damaged beyond repair.

(5) Inspect all attaching hardware for distortion and damaged threads. Replace if defective.

d. Alternator Regulator. The alternator regulator is a 24-volt integral unit provided to control the charging current from the alternator to the battery.

(1) On-engine testing. Defects in the alternator or regulator are indicated on the ammeter by a continuous high-chargingrate when the battery is low, or by a low or no-charging rate when the battery is fully charged.

(2) When a high charging rate is indicated the trouble is in the regulator or battery. Replace or repair the defective unit.

(3) Wiring diagram. (fig. 4-11).

4-8. **Engine Removal.** Remove engine assembly as follows: (Refer to Appendix D for location of engine components).

a. Remove hydraulic pump assembly per instructions in paragraph 4-10.

b. Disconnect negative cable at battery and positive cable at starter.

c. Disconnect fuel line at fuel filter and plug line to prevent fuel leakage. (fig. 4-10).

d. Disconnect oil gage line located at rear of magneto and remove magneto ground wire.

e. Loosen alternator bracket and remove fan belt (32, fig. 4-6).

f. Disconnect flexible exhaust pipe at the exhaust manifold.

g. Remove throttle and choke cables at engine connection points.

h. Remove four (4) mounting bolts in engine base. .

i. Secure engine with hoist through the exhaust manifold web, hoist until free of test stand.

4-9. Engine Replacement. To replace engine proceed as follows:

a. Secure engine with hoist to web of exhaust manifold and lift into position on test stand,

b. Replace four (4) mounting bolts and tighten.

c. Replace fan belt (32, fig. 4-6) and tighten alternator bracket,

d. Connect oil gage line at rear of magneto and replace magneto ground wire.

e. Connect fuel line to fuel filter.

f. Connect throttle and choke cables.

g. Connect flexible exhaust pipe to exhaust manifold and tighten clamp.

h. Connect positive cable to starter and negative cable to battery.

i. Replace hydraulic pump per instructions in paragraph 4-11.

j. Refer to operating instructions for checking engine and test stand operation.

4-10. Hydraulic Pump and Tank Removal. The following procedures describe removal of the hydraulic pump and tank assembly.

a. Remove housing assembly (1, fig. 4-1).

b. Drain hydraulic fluid reservoir before proceeding.

c. Remove plumbing from reservoir.

d. Remove reservoir (1, fig. 4-4).

e. Remove inlet and outlet lines at hydraulic pump (20 and 22, fig. 4-5).

f. Remove volume control and compensator control (34 and 50, fig. 4-2).

g. Secure hydraulic pump body to hoist.

h. Remove chain drive and unfasten 4 mounting bolts (40, fig. 4-5) which secure pump to mounting adapter (26, fig. 4-5).

i. Move pump to rear approximately 6 inches and lift free of stand with hoist.

4-11. Hydraulic Pump Replacement. To replace the hydraulic pump proceed as follows:

a. Secure hydraulic pump to hoist and lift into position.

b. Replace 4 mounting bolts (40, fig. 4-5) and secure pump to mounting adapter (26, fig. 4-5). Replace chain drive.

c. Replace volume control and compensator control (34 and 50, fig. 4-2).

d. Connect inlet and outlet lines at hydraulic pump (20 and 22, fig. 4-5).

e. Replace reservoir (1, fig. 4-4) and connect all plumbing.

f. Fill reservoir with hydraulic fluid and run test stand per operational procedure.

g. Replace housing assembly (1, fig. 4-1).

h. Hydraulic system diagram (fig. 4-12).

Section V. SPECIAL TOOLS AND EQUIPMENT

No special tools are required to perform direct and general support maintenance of the hydraulic test stand.

Section VI. REPAIR PARTS LIST (ILLUSTRATED)

4-12. Introduction. This parts breakdown lists illustrates the assemblies and detail parts which comprise the unit. The list is constructed as follows:

a. Figure and Index Number Column. In this column the number of the figure in which the part is illustrated. The number following the dash is the index number which identifies the part in the illustration.

b. Part Number of Column. All the part numbers in this column refer to the actual vendor (vendor code appears after the description) except government standard parts. The code number for all vendors (including government standard sources) are listed in vendor code list.

c. ***Description of Column.*** This column describes each assembly, subassembly, detail part and attaching part of the unit.

d. Units per Assembly Column. Thiscolumn lists the number of units per assembly or subassembly required for one major assembly, minor assembly or subassembly respectively.

VENDOR CODE

CODE	*ADDRESS*
00624	Aeroquip Corp. Jackson, Michigan 49203
06004	Bassick Division Stewart Warner Bridgeport, Corm. 06602
06541	Penn Controls, Inc. Milwaukee, Wise. 53215
14798	Deutsch Metal Components Los Angeles, Ca. 90248
16764	Delco Remy Anderson, Indiana 46011
16954	Abex, Denisen Division Columbus, Ohio 43216
19728	Prestolite Battery Co. Toledo, Ohio 43601
20954	Tandy Corp. Fort Worth, Texas 76101
22031	Air Way Mfg. Company Olivet, Michigan 49076
22938	Prototype Development Cleveland, Ohio 44125
24161	Gates Rubber Co. Denver, Colorado 80217
24207	M & M Flow Products, Inc. Chicago, Ill. 60649
30327	Imperial Eastman Chicago, Ill. 60648
45681	Parker Hannifin Cleveland, Ohio 44112
53155	Precision Laboratories, Inc. Oklahoma City, Ok. 73119

VENDOR CODE (Con't)

CODE	*ADDRESS*
57733	Stewart Warner Chicago, Ill. 60614
66289	Teledyne Wisconsin, Corp. Milwaukee, Wise. 53219
71126	HomerBronson Co. Beacon Falls, Conn. 06403
71213	Buckeye Brass & Mfg. Co. Cleveland, Ohio 44103
71400	Bussman Mfg. Co. St. Louis, Mo. 63045
72100	Marshalltown Mfg. Co. Marshalltown, Iowa 50158
72619	Dialight Corp. Brooklyn, N. Y. 11237
75915	Littlefuse Inc. Des Planes, Ill. 60016

CODE	*ADDRESS*
81321	Purolator Products Rahway, N. J. 07045
86768	Republic Mfg. Co. Cleveland, Ohio 49125
91510	Automatic Valve Co. Farmington, Mich. 48024
91816	Circle Seal Anaheim, Ca. 92803
9576	The Lenz Company Dayton, Ohio 45401
98251	Sylvania Elect. Hicksville, N. Y. 18848
98441	Stratoflex Inc. Fort Worth, Texas 76114
98660	Flodar Corp. Cleveland, Ohio 44110
98750	San Antonio Air Material Area San Antonio, Texas 78241

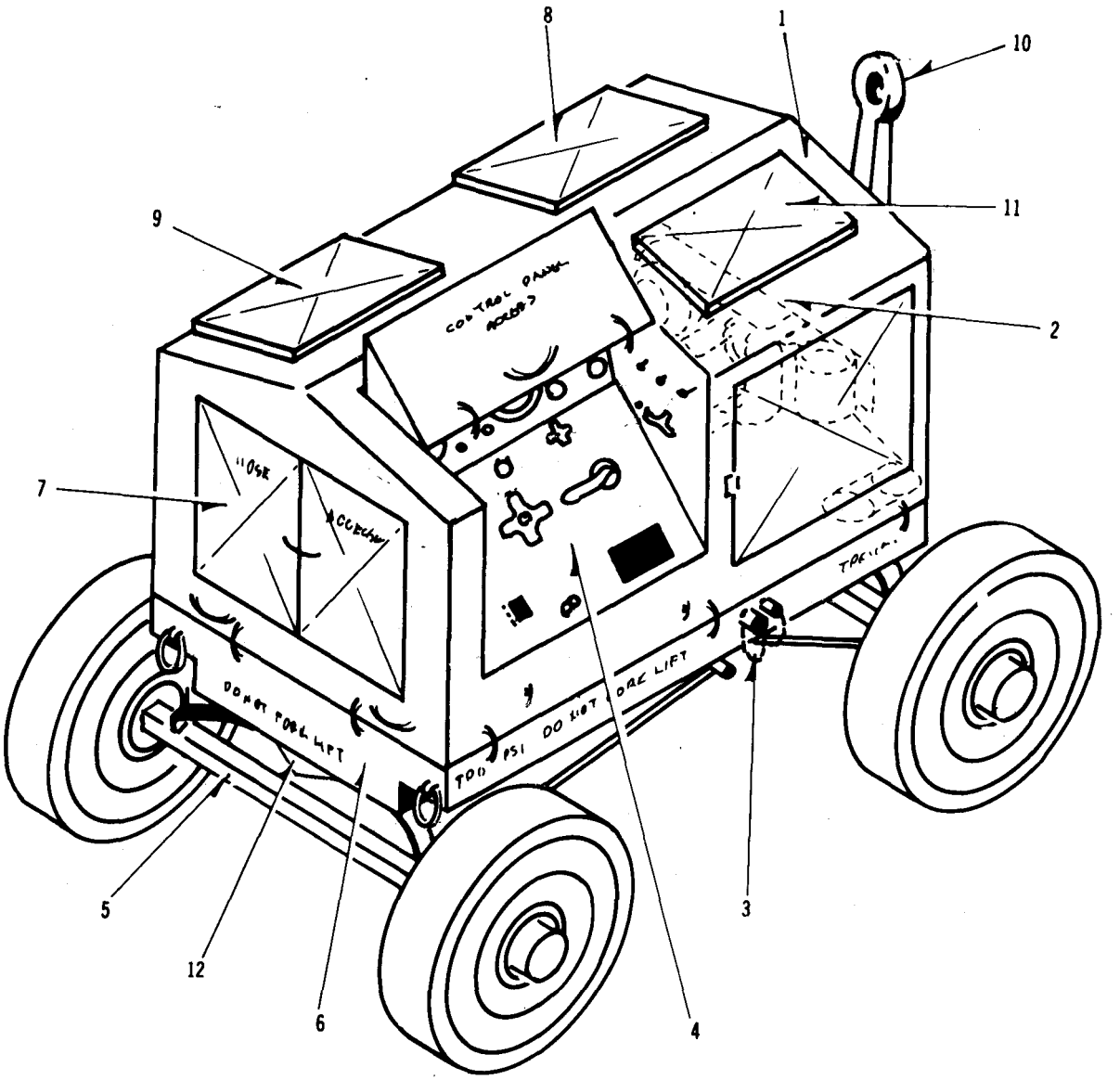


Figure 4-1. Hydraulic Test Stand, D-5C

Fig. & Index No..	Part No.	Description	Vendor	Qty./ Assy .
4-1-1	74-100-8	Housing Assembly	53155	1
-2	MVG-4D	Engine, Gasoline (See Appendix D) for breakdown)	66289	1
-3		Couplings, Inlet & Outlet	00624	1
-4	74-100-51	Control Panel	53155	1
-5	245	Running Gear	22938	1
-6	74-100-6	Lower Chassis	53155	1
-7	74-100-2	R & L Access Doors, Assembly	53155	1
-8	74-100-1	Engine Cooling Doors	53155	1
-9	74-100-1	Hydraulic Reservoir Access Door	53155	1
-10	1-3502	Drawbar	22938	1
-11	74-100-1	Fuel Tank Access Door	53155	1
-12	74-100-11	Fuel Tank	53155	1

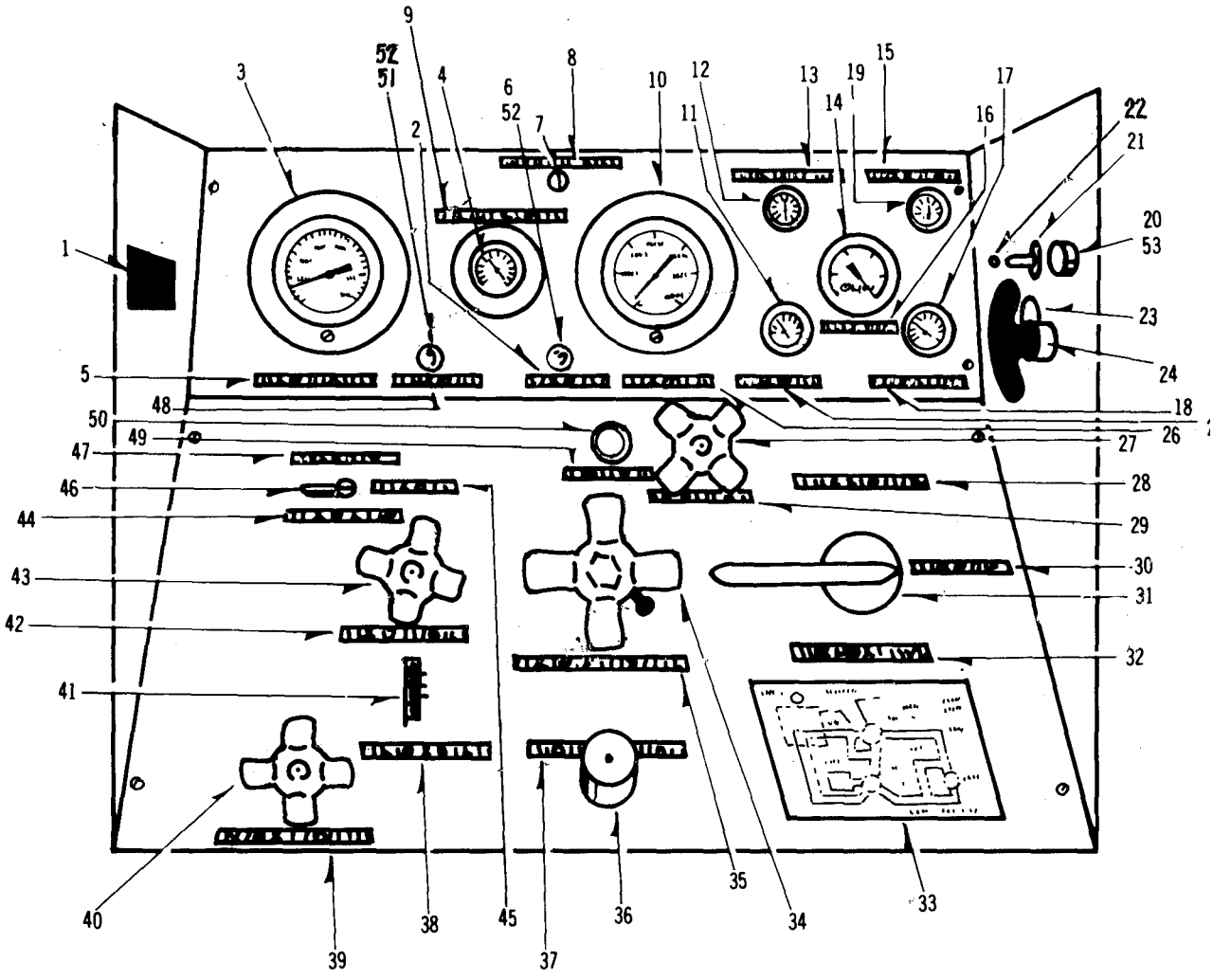


Figure 4-2. Control Panel and Instrument Assembly (Front View)

Fig. & Index No.	Part No.	Description	Vendor	Qty./ Assy.
4-2-	74-100-51	Control Panel & Instrument Assy.	53155	
-1	7400-1	Manufacturer's Nameplate	53155	1
-2	7400-2	Nameplate, Hi-Filter Warning	53155	1
-3	176F-33	Gage, Filter Pressure	72100	1
-4	2 1/2" V-5	Gage, Temperature 40°+ 200°F.	72100	1
-5	7400-4	Nameplate, Filter Pressure	53155	1
-6	806-1710-0431-504	Hi-Filter Warning	72619	2
-7	832-FS-04	Fitting, Gage Test	30327	1
-8	7400-7	Nameplate, Gage Test	53155	1
-9	7400-9	Nameplate, Fluid Temp	53155	1
-l0	177F-33	Gage, High Pressure	72100	1

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy.
-11	61 6-B	Gage, Fuel Level	57733	1
-12	BS-11	Gage, Oil Pressure	66289	1
-13	7400-6	Nameplate, Oil Pressure	53155	1
-14	TH-89	Gage, Tach Hour Meter	16764	1
-15	7400-10	Nameplate, Ammeter	53155	1
-16	7400-11	Nameplate, Tach Hour Meter	53155	1
-17	61 6-B	Gage, Fluid Level	57733	1
-18	7400-12	Nameplate, Fluid Level	53155	1
-19	D-357-X	Ammeter	57733	1
-20	845-0090	Fuse, Holder (Fuse, 5 Amp)	20954	1
-21	717-0614	Switch, Ignition	20954	1
-22	933-6223	Switch, Starter	20954	1
-23	VE-693-1	Choke Control	66289	1
-24	VE-527-W	Throttle Control	66289	1
-25	7400-13	Nameplate, Fuel Level	53155	1
-26	7400-5	Nameplate, Fluid Pressure	53155	1
-27	PMFFG-2004	Valve, Flow Control	24207	1
-28	7400-14	Nameplate, Return	53155	1
-29	7400-22	Nameplate, Flow Control	53155	1
-30	7400-23	Nameplate, Reservoir	53155	1
-31	744-2002	Valve, Selector	86768	1
-32	7400-24	Nameplate, Return Flow Select	53155	1
-33	7400-25	Nameplate, Flow Schematic	53155	1
-34	74-100-177	Volume Control Assembly	53155	1
-35	7400-27	Nameplate, Volume Control	53155	1
-36	R-6701-4	Valve, Compensator	86768	1
-37	7400-19	Nameplate, Hi-Pressure Relief	53155	1
-38	7400-20	Nameplate, Flow Indicator	53155	1
-39	7400-26	Nameplate, Fluid By-Pass	53155	1
-40	PMFFG-2004	VAlve, Fluid By-Pass	24207	1
-41	74-100-202	Flow Indicator	53155	1
-42	7400-18	Nameplate, Gage Shut-off	53155	1
-43	PMFFG-2001	Valve, Gage Shut-off	24207	1
-44	7400-17	Nameplate, Filter Pressure	53155	1
-45	7400-15	Nameplate, Outlet	53155	1
-46	108-HD	Valve, Selector	30327	1
-47	7400-16	Nameplate, Inlet	53155	1
-48	7400-3	Nameplate, Low Filter Warning	53155	1
-49	7400-21	Nameplate, Pressure Comp	53155	1
-50	75-100-201	Pressure, Compensator Assembly	53155	1
-51	806-1710-0431-504	Low-Filter Warning	72619	1
-52	313	Light Bulb	98251	2
-53	3AGC5	Fuse	75915	2

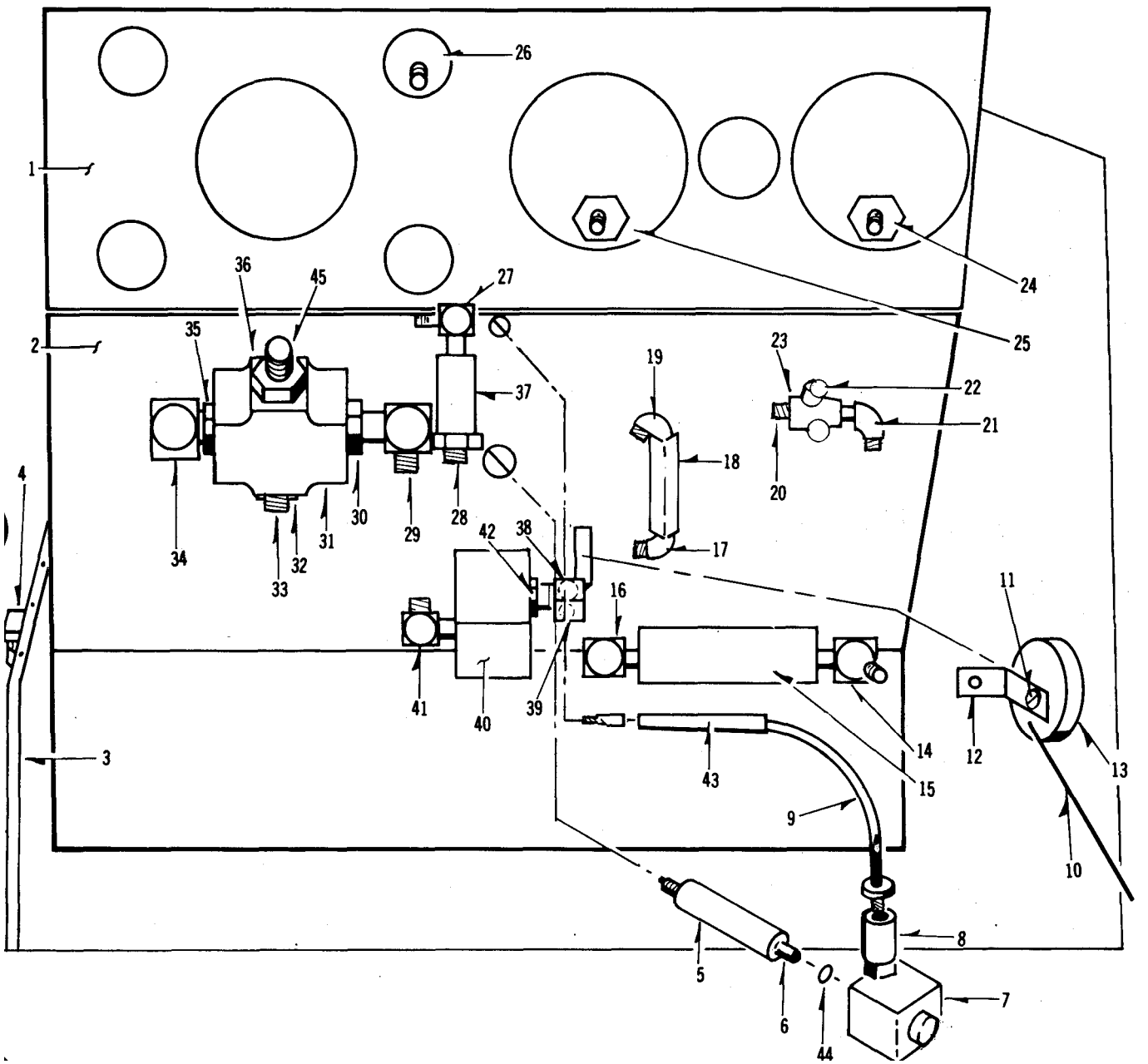


Figure 4-3. Control Panel and Instrument Assembly (Back View)

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy.
4-3-1	74-100-51B	Instrument Panel	53155	1
-2	74-100-51A	Control Panel	53155	1
-3	74-100-69	Support, Hyd. Reservoir & Panel	53155	1
-4	668-2003	Relay, Starter	20954	1
-5	74-100-177-1	Housing, Control Rod	53155	1
-6	74-100-177-2	Control Rod	53155	1
-7	035-16956	Cap	16954	1
-8	035-12555	Housing, Adj.	16954	1
-9	74-100-201-1	Cable, Compensator Control	53155	1
-10	74-100-204-3	Rod, Control	53155	1
-11	AN26-13	Bolt		1
-12	74-100-202-1	Bracket, Mounting	53155	1
-13	74-100-202-3	Indicator, Flow Rate	53155	1
-14	849-FS 08 x 08	Fitting, Elbow 1/2 x 1/2"	30327	1
-15	PMFFG-2004	Valve, Needle 1/2"	24207	1
-16	849-FS 08 x 08	Fitting, Elbow 1/2 x 1/2"	30327	1
-17	849-FS 04 x 02	Fitting, Elbow 1/4 x 1/4"	30327	1
-18	PMFFG-2001	Valve, Needle 1/2"	24207	1
-19	849-FS 04 x 02	Fitting, Elbow 1/4 x 1/4"	30327	1
-20	848-FS 04 x 02	Connector, 1/4" x 1/4"	30327	1
-21	849-FS 04 x 02	Fitting, Elbow 1/4 x 1/4"	30327	1
-22	849-FS 04 x 02	Fitting, Elbow 1/4 x1/4"	30327	1
-23	108 HD 1/8"	Valve, Selector	30327	1
-24	24SB 08 x 04	Fitting, 1/4", to 1/4" Tube	30327	1
-25	24SG 08 x 04	Fitting, 1/2" to 1/4"	30327	1
-26	841 FS 04	Fitting, 1/8"	30327	1
-27	849 FS 08 x 08	Fitting, Elbow 1/2" x 1/2"	30327	1
-28	849 FS 08 x 08	Fitting, Elbow 1/2" x 1/2"	30327	1
-29	849 FS 16 x 16	Fitting, Elbow 90°	30327	1
-30	Commercial	Bushing, Reducer 1 1/4" x 1"		1
-31	744-20D2	Valve, Selector	86768	1
-32	Commercial	Bushing, Reducer, 1 1/4" x 3/4"		1
-33	854 FS 12 x 12	Elbow 45°	30327	1
-34	854 FS 12 x 12	Elbow 45°	30327	1
-35	Commercial	Bushing, Reducer 1 1/4" x 3/4"		1
-36	Commercial	Bushing, Redicer 1 1/4" x 3/4"		1
-37	PMFFG-2004	Valve, Needle 1/2"	24207	1
-38	849 FS 08 x 08	Fitting 1/2" to 1/2"	30327	1
-39	849 FS 08 x 08	Fitting 1/2" to 1/2"	30327	1
-40	R6701-4 3/4S2-1/4P	Relief Valve.	86768	1
-41	849 FS 08 x 12	Fitting, 90° 3/4" x 1/2"	30327	1
-42	Commercial	Bushing, Reducer 3/4" x 1/2"		3
-43	74-100-201-3	Cable Guide	53155	1
-44	AN6227-B8	O'ring	45681	1
-45	848 FS 12 x 12	Fitting, Pipe to Tube	30327	1
-46	Commercial	Bolts 5/16 x 1/2 and Lock Washers		4

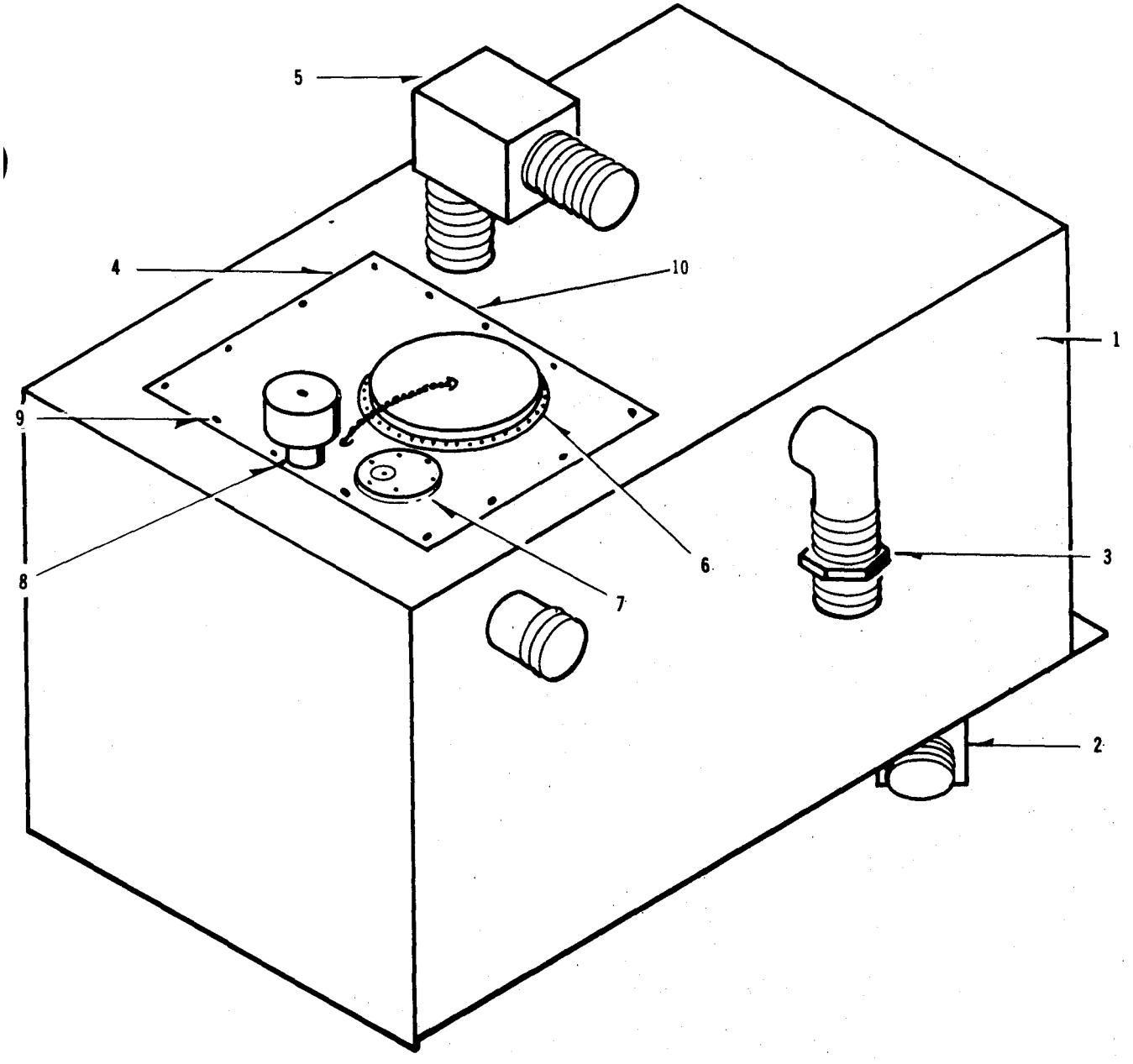


Figure 4-4. Reservoir, Hydraulic Tank Assembly

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy.
4-4-1	74-100-13	Reservoir, Hydraulic Tank	53155	1
-2	849 FS 16 X 16	Fitting, Elbow 90°	30327	1
-3	848 FS 12 X 08	Fitting, Elbow	30327	1
-4	74-100-13-1	Cover, 12″ x 14″ Cleanout	53155	1
-5	849 FS 12 X 12	Fitting, Elbow 90°	30327	1
-6	751-123	Filler & Lid Assembly	86768	1
-7	385-B	Sender	57733	1
-8	BF-4	Breather, Filter	86768	1
-9	Commercial	1/4″ x 20 x 3/4″ Screw, Pan Hd.		14
-10	74-100-13-2	Gasket, 12″ x 14″	53155	1

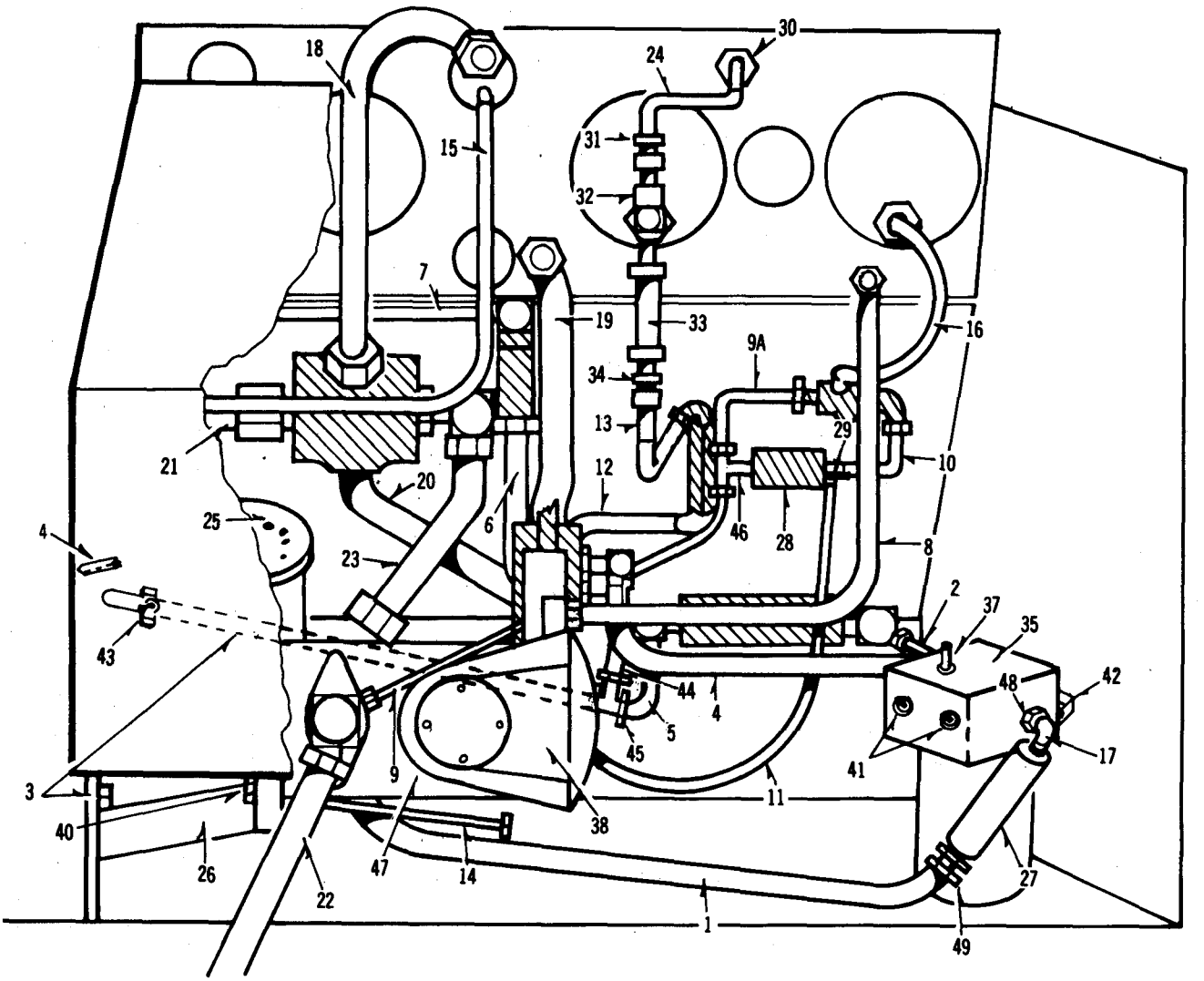


Figure 4-5 Plumbing Installation

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy.
4-5		Plumbing Installation	53155	
-1	74-400-21	Hose Assy Flexible	53155	1
-2	74-400-4	Tube Assy, Hi-Pressure Filter to by-pass	53155	1
-3	74-402-16	Tube Assy, By-Pass Hi-Pressure Relief to return line	53155	1
-4	74-400-10	Tube Assy, Hi-Pressure Filter to Pressure Relief Valve	53155	1
-5	74-402-3 3/4	By-Pass Valve to return line	53155	1
-6	74-400-3	Tube Assy, Hi-Pressure Relief to outlet	53155	1
-7	74-400-36	Tube Assy, Outlet Valve to outlet connection	53155	1
-8	74-400-22	Tube Assy, Pump Case drain to Reservoir	53155	1
-9	74-401-13	Tube Assy, Switch to Pump	53155	1
-9A	74-401-7	Tube Assy, Switch to Selector Valve	53155	1
-10	74-401-9	Tube Assy, Diff. Switch to Pump	53155	1
-11	74-401-17	Tube Assy, Diff. Switch to Filter	53155	1
-12	74-401-5	Tube Assy, Relief Valve to Gage Shut-off Valve	53155	1
-13	74-401-12	Tube Assy, Hi-Pressure Gage from Shut-off Valve	53155	1
-14	74-401-26	Tube Assy, Fuel Line	53155	1
-15	74-401-36	Tube Assy, Oil Pressure	53155	1
-16	74-401-14	Tube Assy, Lo Pressure Hose to Gage from Selector	53155	1
-17	8MPE	Fitting	97576	1
-18	74-402-22	Tube Assy, Return to Reservoir to plug valve	53155	1
-19	74-402-21	Tube Assy, Return from Relief Valve	53155	1
-20	74-402-14	Tube Assy, Selector Valve to Filter	53155	1
-21	74-402-20	Tube Assy, Return from inlet to Selector	53155	1
-22	74-403-34	Tube Assy, Inlet to Pump from Filter	53155	1
-23	74-403-14	Tube Assy, Hyd. Reservoir to Selector Valve	53155	1
-24	74-401-8	Tube Assy, Hi-Pressure Gage Check	53155	1
-25	74-100-200	Filter and Bracket (See Fig. 18)	53155	1
-26	74-100-9	Adapter (3-B)	53155	1
-27	453-1/2S2-6	Check Valve	86768	1
-28	1201-PS-1	Indicator Switch	81321	1
-29	851 FS 02x 02	Fitting, Tee	30327	1
-30	832 FS 04	Bulkhead Fitting	30327	1
-31	848 FS 04x 04	Fitting, Pipe Tube 1/4"	30327	1
-32	5602	Fitting	22031	1
-33	694-1/4B	Snubber	86768	1
-34	848 FS 04x 04	Fitting	30327	1

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy .
4-5-35	P-142-16-0	Filter, Hi-Pressure	81321	1
-36	845 FS 02x02	Fitting, Tee	30327	1
-37	6681089	Switch, Pressure	81321	1
-38	PV-06J-002-52R-OYM-OOQ	Pump, Hydraulic	16954	1
-39	Commercial	Bolt W/Lockwasher 5/8 x 11 x 1 1/2		4
-40	Commercial	Bolt W/Lockwasher 3/8 x 16 x 1 1/4		4
-41	Commercial	Bolt W/Lockwasher3/8 x 16 x 16		2
-42	74-100-54	Bracket, Spacer	53155	1
-43	883 FSO 12x 12	Fitting	30327	1
-44	74-402-2	Tube Assy	53155	1
-45	844 FS 08	Fitting, Tee 1/2"	30327	1
-46	845 FS 12	Fitting, Tee 3/4"	30327	1
-47	849 FSO 12x 12	Fitting	30327	1
-48	721 FS 01	Plug, 1"	30327	1
-49	848 FS 12x 08	Adapter	30327	1

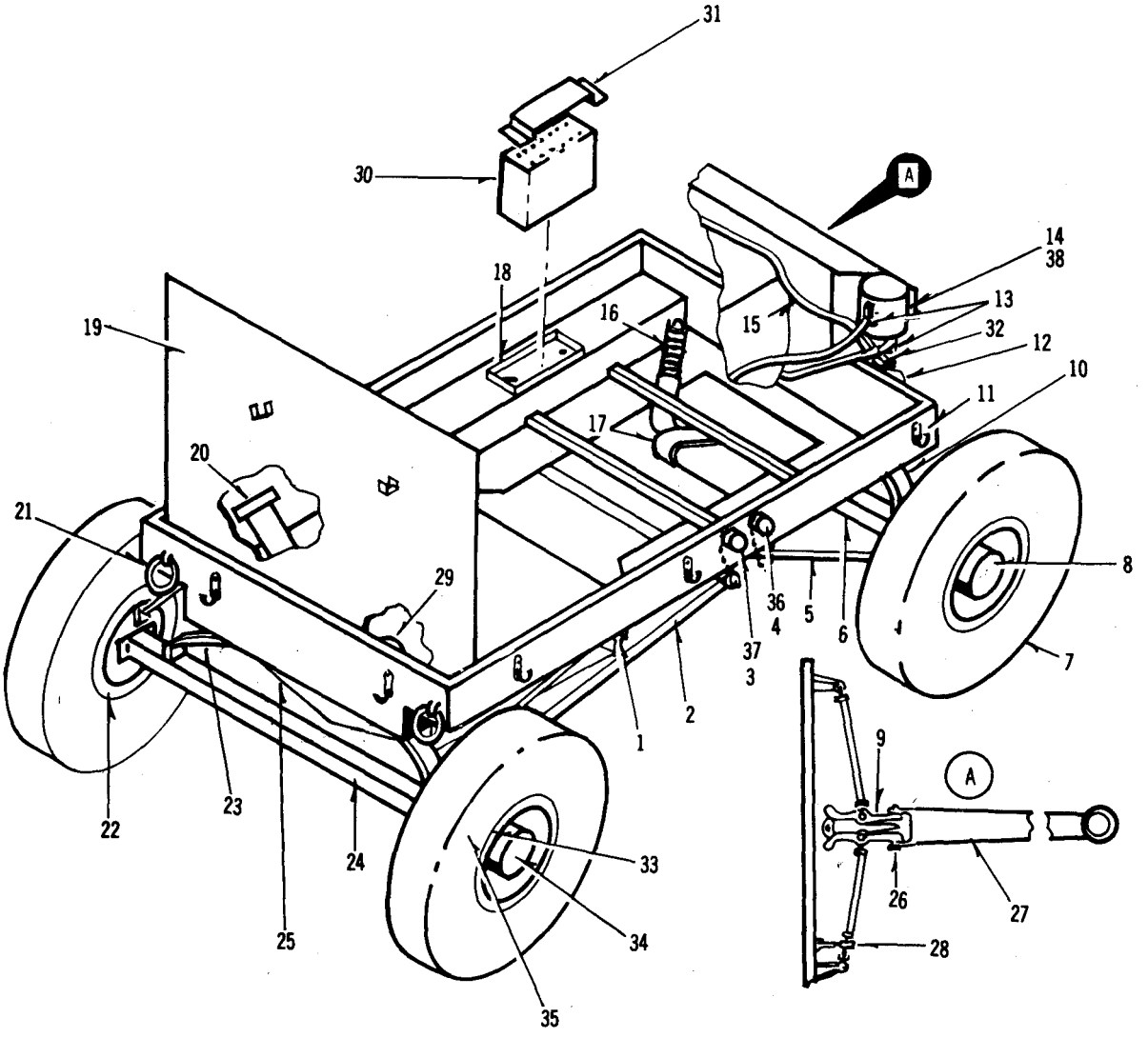


Figure 4-6. Lower Chassis Assembly

Fig. & Index No.	Part No.	Description	Vendor	Qty./ Assy.
4-6-1	74-100-6	Lower Chassis Assembly	53155	1
-2	8300-400M	Brake Rod Assembly	22938	3
-3	155-S11-12D	Coupling Half	00624	1
-4	155-S11-8D	Coupling Half	00624	1
-5	245-5911	Cross Shaft Assembly	22938	1
-6	245-1396	Front Axle Assembly	22938	1
-7	6555	Tire & Tube 600 x 9	22938	4
-8	3712	Wheel Assembly	22938	4
-9	1-3851	Center Arm Assembly	22938	1
-10	4020-1	Front Spring Assembly	22938	1
-11	ZLA-1008-13	Latch Assembly	06004	12
-12	1102379	Alternator	16764	1
-13	74-401-10	Tube Assembly 1/4"	53155	1
-14	S6-AC	Engine Oil Filter	16764	1
-15	74-401-22	Tube Assembly 1/4"	53155	1
-16	40004	Exhaust Tube	16764	1
-17	WD-50-A	Engine Exhaust Muffler	66289	1
-18	74-100-602-1	Lower Bracket, Battery Holder	53155	1
-19	74-100-31	Bulkhead Assembly	53155	1
-20	Commercial	Fuel Filler Cap & Strainer		1
-21	48B7796	Tie Down Ring	98750	4
-22	1-8209	Brake Drum Assembly	22938	2
-23	4020-1	Rear Spring Assembly	22938	1
-24	245-1346	Rear Axle Assembly	22938	1
-25	74-100-11	Fuel Tank	53155	1
-26	5400-1	Center Pin	22938	1
-27	1-3502	Draw Bar	22938	1
-28	1-5904	Brake Handle Assembly	22938	1
-29	385-B	Transmitter, Fuel Quantity	57733	1
-30	US-4-HN	Battery, 24V, MS75047-1	19728	1
-31	74-100-602-3	Top Bracket, Battery Holder	53155	1
-32	2430	Alternator Drive Belt	24161	1
-33	2478-1	Inner Bearing	60038	4
-34	15123	Outer Bearing (Koyo)	22938	4
-35	6311	Grease Seal	22938	4
-36	155S7-8D	Cap Assy W/Chain	00624	1
-37	155S7-12D	Cap Assy W/Chain	00624	1
-38	P-11 5	Oil Filter Element	16764	1

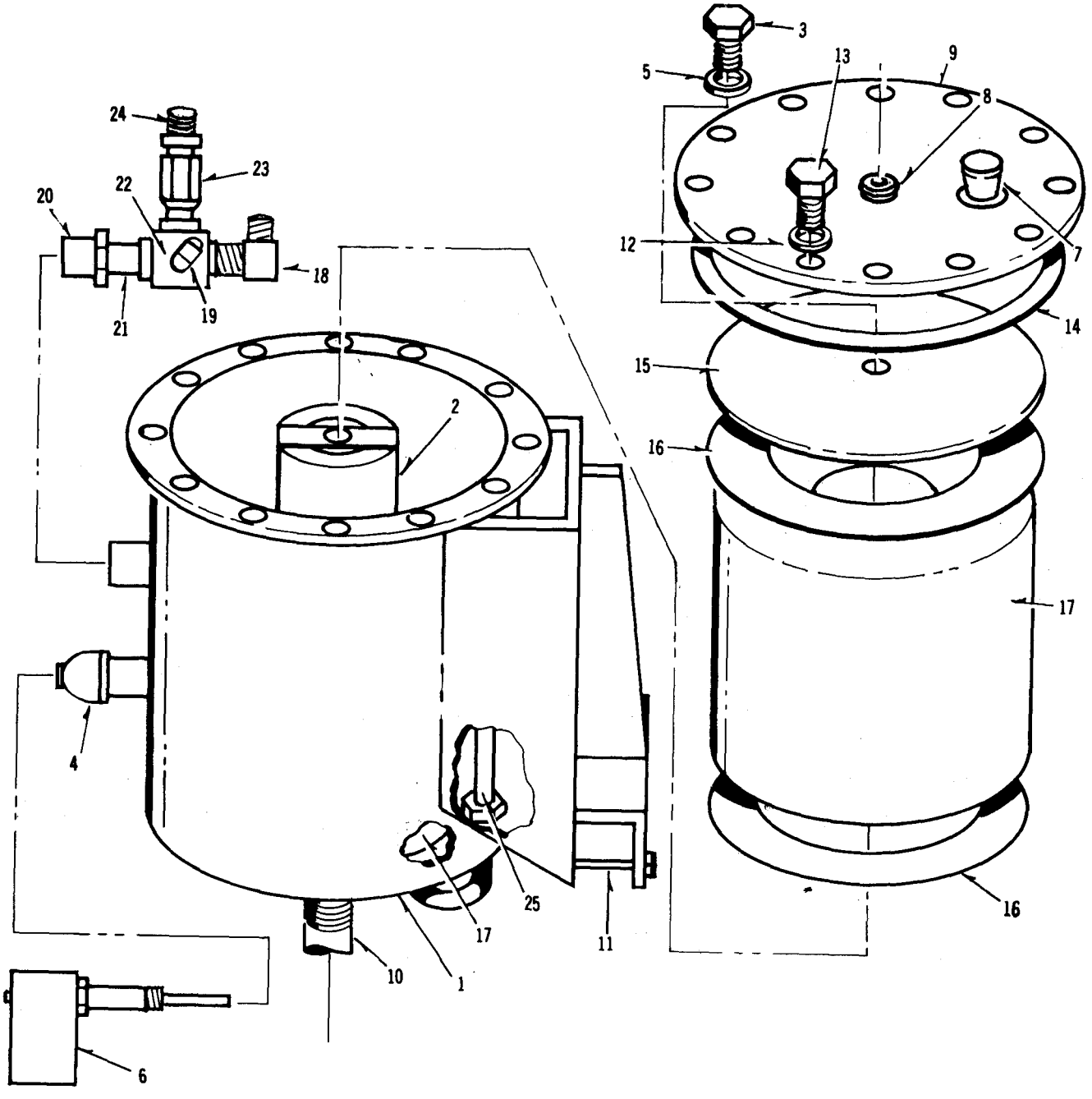


Figure 4-7. Filter and Control Assembly

Index No.	Part No.	Description	Vendor	Qty./ Assy.
4-7	74-100-200	Filter and Control Assembly	53155	1
-1	74-100-200-1	Housing, Filter	53155	1
-2	74-100-200-2	Filter, Anchor Assembly	53155	1
-3	Commercial	Bolt, 5/16" x 1"		1
-4	Commercial	Reducer, Bell 3/4" x 1/2"		1
-5	Commercial	Washer, 5/16" Seal		1
-6	A1 9ABC	Temperature Control	06541	1
-7	BJ1000-ASI	Plug, Vent	91510	1
-8	Commercial	Plug, Drain 1/4" Pipe		2
-9	74-100-200-9	Cover, Housing Top	53155	1
-10	849 FS 16 x 16	Fitting, Elbow 90°	30327	1
-11	Commercial	Bolt, Steel 3/8" x 3" W/Nut & Washers		2
-12	Commercial	Lockwasher 1/4", Steel		12
-13	Commercial	Bolt, Steel 1/4" x 20 x 3/4		12
-14	2-366	O 'ring	45681	1
-15	74-100-200-15	Plate, Filter Anchor	53155	1
-16	74-100-200-16	Seal, Filter	53155	1
-17	30316-20	Filter, Element, AN6236-3	81321	1
-18	849 FS 12 x 12	Fitting, Elbow 90°	30327	1
-19	849 FS 02 x 02	Fitting, Elbow 90°	30327	1
-20	Commercial	Bushing, Reducer 1" x 3/4"		1
-21	Commercial	Union, Allthread 3/4" x 1"		1
-22	PF3110-12	Tee, 3/4" x 3/4"	98660	1
-23	559B-6MP-10	Valve, Check,	91816	1
-24	854 FS 12 x 12	Elbow, 45°	30327	1
-25	V-5 (2 1/2" dial)	Temperature Gage	72100	1

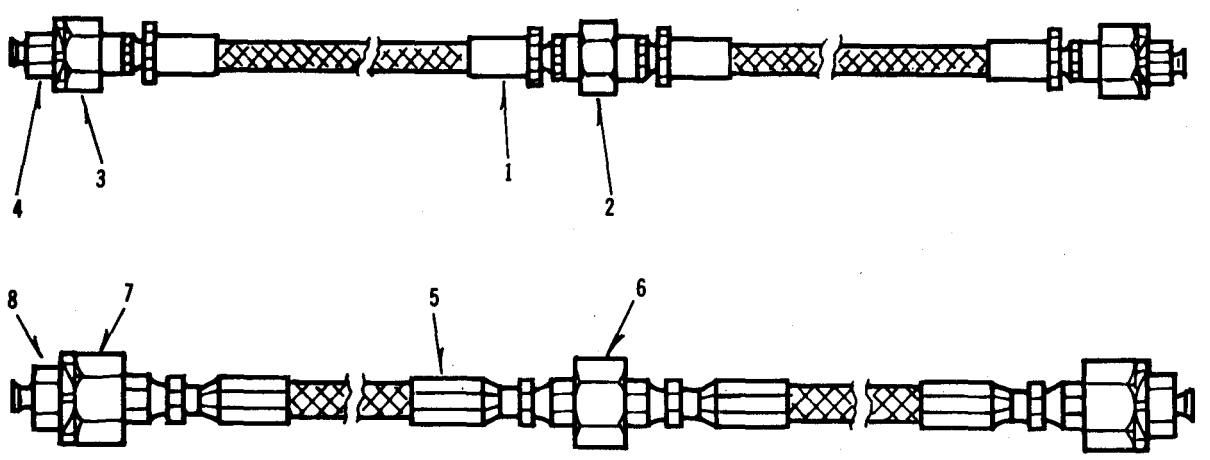


Figure 4-8. Hose Assembly

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
	74TS100-10-1	Hose Assembly	53155	
4-8-1	MS27363H1200	Hose	14798	2
-2	AN815-8	Union	14798	1
-3	155-S5-8D	Coupling	00624	2
-4	155-S9-8D	Plug	00624	2
	74TS100-10-3	Hose Assembly		
-5	MS28741-12-1200	Hose	14798	2
-6	AN815-12D	Union	14798	1
-7	155-S5-12D	Coupling	00624	2
-8	155-S9-12D	Plug	00624	2

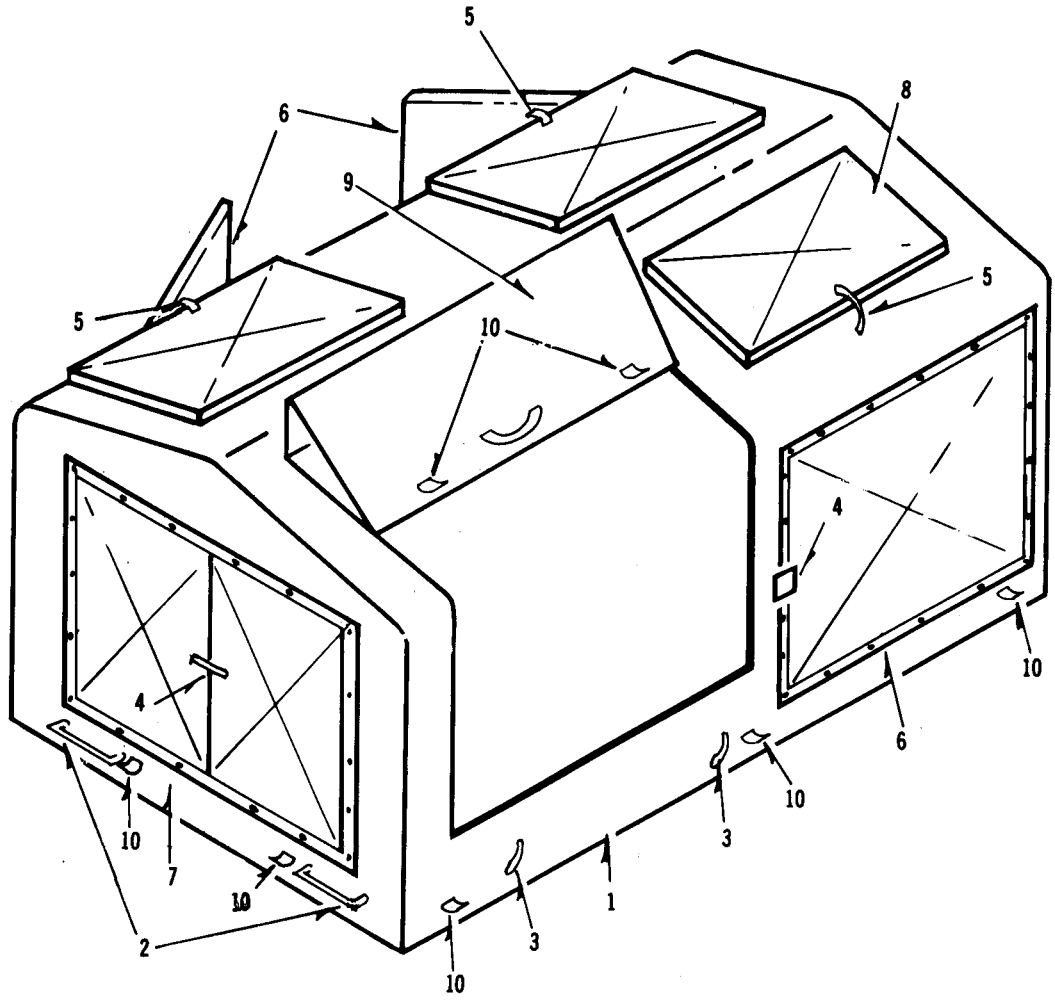


Figure 4-9. Housing and Door Assembly

Fig. & Index No.	Part No.	Description	Vendor	Qty./ Assy.
4-9-l	74-100-8	Housing and Door Assembly	53155	1
-2	Commercial	Handle, 6“ x 1“		4
-3	HS11-ZL-1042-12	Strike	06004	12
-4	Commercial	Hinge, Bracket		3
-5	ZLA-1202-13	Latch, Doors	06004	5
-6	74-100-8-1	Frame and Door Assy	53155	3
-7	74-100-8-2	Frame and Door Assy	53155	1
-8	74-100-8-3	Door Assembly, Top Access	53155	3
-9	74-100-8-4	Door Assembly, Instrument and Control	53155	1
-10	ZLA-1008-13	Fastener	06004	12

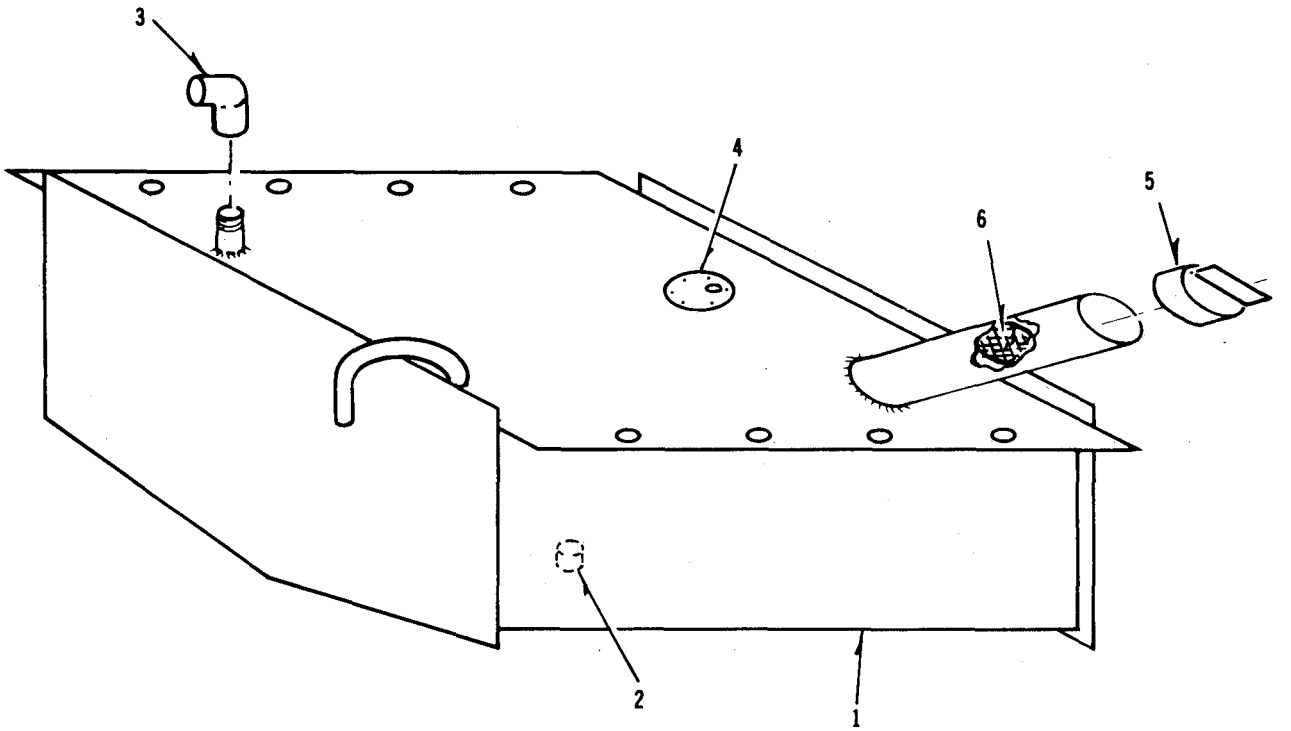


Figure 4-10. Tank, Fuel Gasoline

Fig. & Index No.	Part No.	Description	Vendor	Qty. / Assy.
4-10-1	74-100-11	Tank, Fuel	53155	1
-2	Commercial	1/2" Plug, Drain		1
-3	50F	Elbow, 1/4" X 1/8 FPT	30327	1
-4	385-B	Sender, Fuel	57733	1
-5	74-100-11-1	Cap, Fuel Tank	53155	1
-6	74-200-21-2	Strainer	53155	1

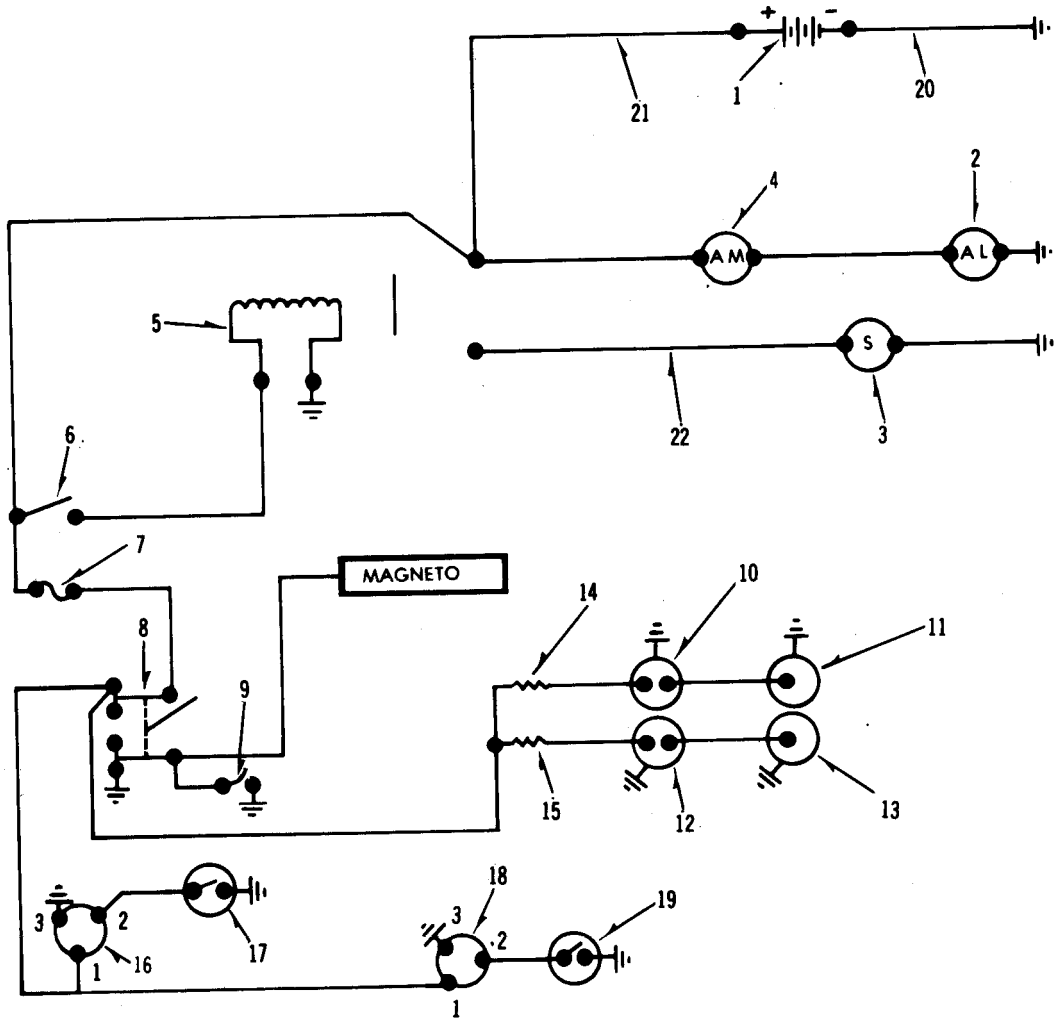


Figure 4-11. Wiring Schematic

No.	No.	Color	Length	Location	Vendor	Assy
4-11 .1	74-1 00-WS-1	WH	4 3/4"	Ignition to Fuse	53155	1
-2	74-1 00-WS-2	WH	7 1/2"	Fuse to Ignition SW	53155	1
-3	74-1 00-WS-3	GR	42"	Ign. SW to Magneto	53155	1
-4	74-1 00-WS-4	VI	63 "	Ign. SW to Thermo SW	53155	1
-5	74-1 00-WS-5	BK	11 "	Magneto Ground	53155	1
-6	74-1 00-WS-6	WH	18"	Ign. SW Fluid Qty. Ind.	53155	1
-7	74-1 00-WS-7	WH	33"	Hi Press. Warning Lite	53155	1
-8	74-100-WS-8	WH	14"	PB SW to Ammeter	53155	1
-9	74-100-WS-9	WH	59 "	PB SW to Relay	53155	1
-10	74-100-WS-10	BR	42"	Fluid Qty. Ind.Hyd.Smtr.	53155	1
-11	74-100-WS-11	WH/or/BK	68"	Ampmeter to Alternator	53155	1
-12	74-100-WS-12	WH/or/BK	60"	Ampmeter to Solonoid	53155	1
-13	74-100-WS-13	BR	23 "	Fluid Qty.Ind.FuelQty.Ind	53155	1
-14	74-100-WS-14	BR	61 "	Fuel Qty.Ind. Xmtr.	53155	1
-15	74-100-WS-15	BK	6"	Warning Lite	53155	1
-16	74-100-WS-16	BR	16"	Warning Lite to Hi Press Switch	53155	1
-17	74-100-WS-17	WH	9"	Warning Lite to Low Press Switch	53155	1
-18	74-100-WS-18	BK	8 1/2"	Warning Lite to H/P SW	53155	1
-19	74-100-WS-19	WH	4 1/2"	SOL Jumper	53155	1
-20	74-100-WS-20	RD	12"	Relay to Starter	53155	1
-21	74-100-WS-21	BK	10"	Battery to Ground	53155	1
-22	74-100-WS-22	BK	10"	Battery to Relay	53155	1
	74-100-WS-100			Harness Assembly	53155	1

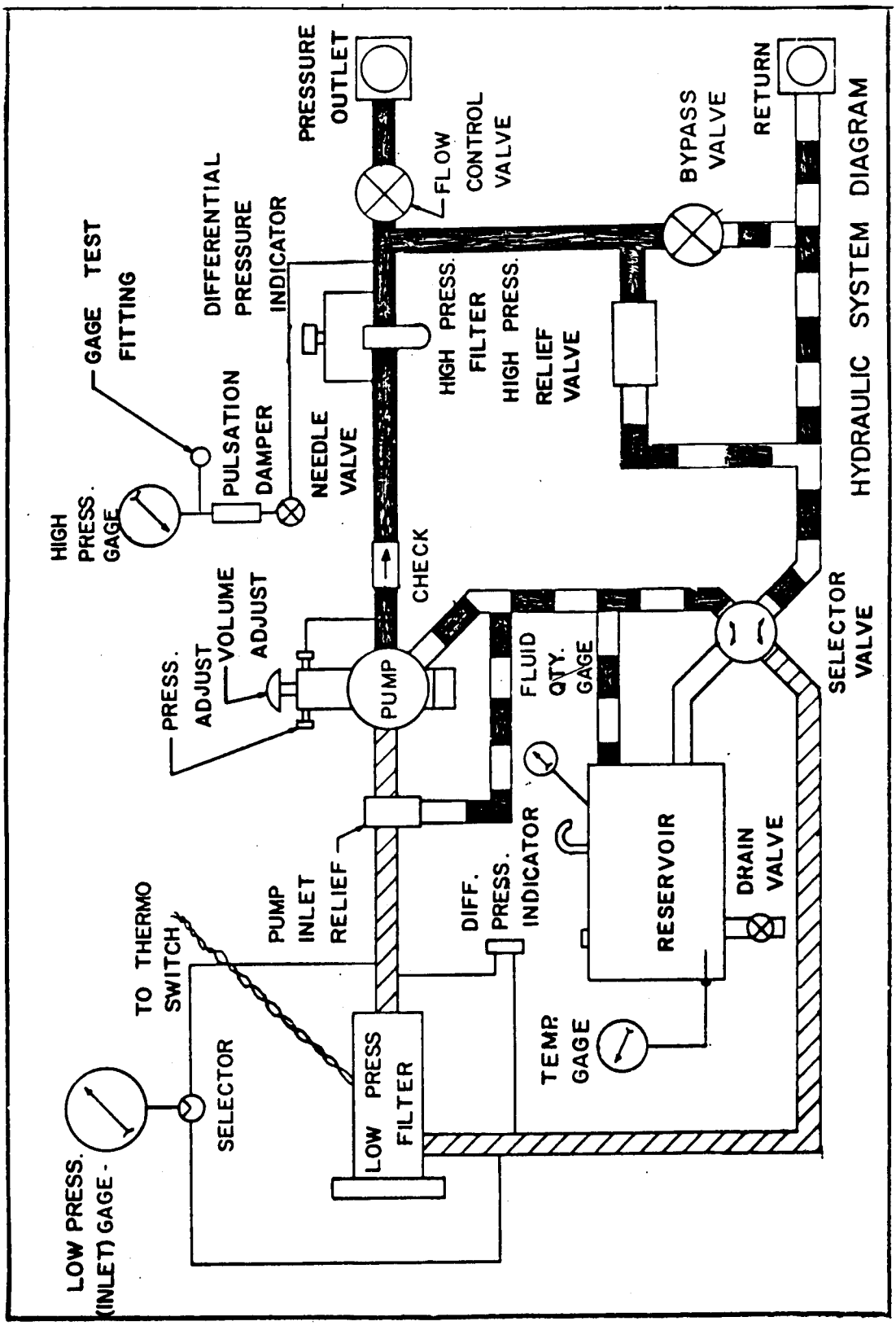


Figure 4-12. Hydraulic System Diagram

APPENDIX A
REFERENCES

A-1. Dictionaries of Terms and Abbreviations.

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AR310-50 . . . . . Authorized Abbreviations and Brevity Codes

A-2. Publication Indexes.

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A-3. Logistics and Storage.

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A-5. Other Publications.

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AR 55-38 . . . . . Reporting of Transportation Discrepancies in Shipments
AR 700-58 . . . . . Packaging Improvement Report
DA PAM 310-13 . . . . . Military Publications Posting and Filing
FM-21-11 . . . . . First Aid for Soldiers
TB 43-180 . . . . . Calibration Requirements for the Maintenance of Army Materiel
TM 750-244 -1-4 . . . . . Procedures for the Destruction of Aviation Ground Support Equipment (FSC 4920) to Prevent Enemy Use

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. Maintenance Allocation Chart.

a. This Maintenance Allocation Chart (MAC) assigns maintenance functions in accordance with the Three Levels of Maintenance concept for army aircraft. These maintenance leve1: Aviation Unit Maintenance (AVUM), Aviation Intermediate Maintenance (AVIM) and Depot Maintenance are dipicted on the MAC as:

AVUM which corresponds to the O code in the Repair Parts and Special Tools List (RPSTL).

AVIM which corresponds to the F code in the Repair Parts and Special Tools List (RPSTL).

DEPOT which corresponds to the D code in the Repair Parts and Special Tools List (RPSTL).

b. The maintenance to be performed below depot and in the field is described as follows:

(1) Aviation Unit Maintenance (AVUM). AVUM activities will be staffed and equipped to perform high frequency "On- Equipment" maintenance tasks required to retain or return equipment to a serviceable condition. The maintenance capability of the AVUM will be governed by the MAC and limited by the amount and complexity of support equipment, facilities required, and number of spaces and critical skills available. The range and quantity of authorized spare modules/components will be consistent with the mobility requirements dictated by the air mobility concept. (Assignment of maintenance tasks to divisional company size aviation units will consider the overall maintenance capability of the division, the requirement to conserve personnel and equipment resources and air mobility requirements).

(a) Company Size Aviation Units. Perform those tasks which consist primarily of preventive maintenance and maintenance repair and replacement functions associated with sustaining a high level of equipment operational readiness. Perform maintenance inspections and servicing to include daily, intermediate, periodic and special inspections as authorized by the MAC or higher headquarters. Identify the cause of equipment/system malfunctions using applicable technical manual troubleshooting instructions, Built-In-Test Equipment (BITE), installed instruments, or easy to use Test Measurement and Diagnostic Equipment (TMDE). Replace worn or damaged modules/components which do not require complex adjustments or system alignment and which can be removed/installed with available skills, tools and equipment. Perform operational and continuity checks and make minor repairs. Perform servicing, functional adjustments, and minor repair/replacement. Evacuate unserviceable modules/components and end items beyond the repair capability of AVUM to the supporting AVIM.

(b) Less than Company Size Aviation Units. Aviation elements organic to brigade, group, battalion headquarters and detachment size units are normally small and have less than ten aircraft assigned. Maintenance tasks performed by the aircraft crew chief or assigned aircraft repairman will normally be limited to preventive maintenance, inspections, servicing, spot painting, stop drilling, minor adjustments, module/component fault diagnosis and replacement of selected modules/components. Repair functions will normally be accomplished by the supporting AVIM unit.

(2) ***Aviation Intermediate Maintenance (AVIM).*** AVIM provides mobile, responsive "One Stop" maintenance support, (Maintenance functions which are not conducive to sustaining air mobility will be assigned to depot maintenance). Performs all maintenance functions authorized to be done at AVUM. Repair of equipment for return to user will emphasize support or operational readiness requirements. Authorized maintenance includes replacement and repair of modules/components and end items which can be accomplished efficiently with available skills, tools, and equipment. Establishes the Direct Exchange (DX) program for AVUM units be repairing selected items for return to stock when such repairs cannot be accomplished at the AVUM level. Inspects, troubleshoots, test, diagnoses, repairs, adjusts, calibrates, and aligns system modules/components. Module/component disassembly and repair will support the DX program and will normally be limited to tasks requiring cleaning and

the replacement of seals, fittings and items of common hardware. Unserviceable reparable modules/components and end items which are beyond the capability of AVIM to repair will be evacuated to Depot Maintenance. This level will perform special inspections which exceed AVUM capability. Provides quick response maintenance support, on-the-job training, and technical assistance through the use of mobile maintenance contact teams. Maintains authorized operational readiness float. Provides collections and classification services for serviceable/unserviceable material. Operates a cannibalization activity in accordance with AR 750-50. (The aircraft maintenance company within the maintenance battalion of a division will perform AVIM functions consistent with air mobility requirements and conservation of personnel and equipment resources. Additional intermediate maintenance support will be provided by the supporting non-divisional AVIM unit).

B-2. Use of the Maintenance Allocation Chart.

a. The MAC assigns maintenance functions to the lowest level of maintenance based on past experience and the following consideration:

(1) Skills available.

(2) Time required.

(3) Tools and test equipment required and/or available.

b. Only the lowest level of maintenance authorized to perform a maintenance function is indicated. If the lowest level of maintenance cannot perform all tasks of any single maintenance function (e.g., test repair), then the higher maintenance level(s) that can accomplish additional tasks will also indicated.

c. A maintenance function assigned to a maintenance level will automatically be authorized to be performed at any higher maintenance level.

d. A maintenance function that cannot be performed at the assigned level of maintenance for any reason may be ejaculated to the next higher maintenance organization. Higher maintenance levels will perform the maintenance functions of lower maintenance levels when required or directed by the appropriate commander.

e. The assignment of a maintenance function will not be construed as authorization to carry the associated repair parts in stock. Authority to requisition, stock, or otherwise secure necessary repair parts will be as specified in the repair parts and special tools list appendix.

f. Normally there will be no deviation from the assigned level of maintenance. In cases of operational necessity, maintenance functions assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be specifically authorized by the maintenance officer of the level of maintenance to which the function is assigned, The special tools, equipment, ect. required by the lower level of maintenance to perform this function will furnished by the maintenance level to which the function is assigned. This transfer of a maintenance function to a lower maintenance level does not relieve the higher maintenance level of the responsibility of the function. The higher level of maintenance has the authority to determine:

(1) If the lower level is capable of performing the work.

(2) If the lower level will require assistance or technical supervision and on-site inspection.

(3) If the authorization will be granted.

g. Organizational through depot maintenance of the US Army Electronics Command equipment will be performed by designated US Army Electronics Command personnel.

h. Changes to the MAC will be based on continuing evaluation and analysis by responsible technical personnel and on reports received from field activities.

B-3. Definitions.

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical and electrical characteristics with established standards.

b. Test. To verify serviceability and detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. *Service.* To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents and air.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Aline. To adjust specified variable elements of an item to bring to optimum performance.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipmentused in precise measurement. Consists of the comparison of the comparison of two instruments, one of which is a ;certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument or

test equipment being compared with the certified standard.

g. Install To set up for use in an operational environment such as an emplacement, site or vehicle.

h. Replace. To replace unserviceable items with serviceable assemblies, subassemblies or parts.

i. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

j. Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards and published for the specific item to be overhauled.

k. Rebuild. To restore an item to a standard as nearly as possible to the original or new condition in appearance, performance, and life expectancy. This is accomplished through the maintenance technique of complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

B-4. Functional Groups.

Standard functional groupings are not considered feasible for aviation ground support equipment due to variation and complexity. Therefore, variations to functional groupings may occur.

B-5. Maintenance Categories and Work Times.

The maintenance categories (levels) AVUM, AVIM, and DEPOT are listed on the Maintenance Allocation Chart with individual columns that indicate the work times for maintenance functions at each maintenance level, Work time presentations such as 0.1 indicate the average time it requires a maintenance level to perform a specified maintenance function. If a work time has not been established, the columnar presentation shall indicate "-•-". Maintenance levels higher than the level of maintenance indicated are authorized to perform the indicated function.

B-6. Tools and Test Equipment (Section III).

Common tool sets (not individual tools), special tools, test and support equipment required to perform maintenance functions are listed alphabetically with a reference number to permit cross-referencing to column 5 in the MAC. In addition, the maintenance category authorized to use the device is listed along with the item National Stock Number (NSN) and, if applicable, the tool number to aid in identifying the tool/device.

Section II. MAINTENANCE ALLOCATION CHART

NOMENCLATURE OF END ITEMS

HYDRAULIC TEST STAND - TYPE D5C P/N 74 TS1000

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(b) REMARKS
			AVUM	AVIM	DEPOT		
00	Test Stand, Hydraulic Systems, Gasoline Engine Drive, Type D5C						
01	Electrical System						
0101	Battery	Inspect	0.1				
		Test	0.3			102	
		Service	0.2				
		Replace	0.5			102	
0102	Ignition Leads	Inspect	0.2				
		Service	0.2				
		Replace	0.5			102	
0103	Alternator	Inspect	0.2				
		Test	0.5				A
		Service	0.2				
		Replace	1.0			102	
		Repair		2.0		110	
0104	Starter Motor	Inspect	0.2				
		Test		0.5		110	
		Service	0.2				
		Replace	1.0			102	
		Repair		2.0		110	
0105	Indicators	Inspect	0.2				
		Replace		0.5		106	
0106	Electrical Wiring, Cables and Switches	Inspect	0.2				
		Test		0.3		110	
		Replace		0.5		110	
		Repair				110	
02	Hydraulic System						
0201	Pump	Inspect	0.1				
		Test		0.5		111	
		Service	0.2				
		Replace		2.5		111	
		Repair			16.0		

Section II. MAINTENANCE ALLOCATION CHART

NOMENCLATURE OF END ITEMS

HYDRAULIC TEST STAND - TYPE D5C P/N 74TS1000

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
0202	Compensator Control	Inspect	0.1				
		Test		0.5			
		Service	0.2				
		Replace		1.0		111	
		Repair		1.0		111	
0203	Valves	Inspect	0.1				
		Test					
		Service	0.2				
		Replace		1.0			
		Repair		1.0			
0204	Fluid Reservoir	Inspect	0.1				
		Service	0.2				
		Replace		2.0		111	
		Repair		1.0		111	
0205	Filter Assemblies	Inspect	0.1				
		Service	1.0				
		Replace	1.5				
		Repair	0.5				
0206	Pressure Gages	Inspect	0.1				
		Replace		1.0		106	
		Calibrate	*				B
0207	Lines, Tubing's Fittings and Hose Assemblies	Inspect	0.1				
		Service	0.3				
		Replace	0.5			102	
03	Engine						
0301	Cylinder Block & Crankcase	Inspect		0.3			
		Replace			3.0		C
		Repair			2.0		
0302	Governor Assembly	Inspect	0.1				
		Test		0.5			A
		Adjust		0.5			
		Replace		1.0		115	
		Repair		1.5		115	
0303	Fuel Pump	Inspect	0.1				
		Test		0.5			A
		Replace		1.0		115	
		Repair		1.0		115	

Section II. MAINTENANCE ALLOCATION CHART

NOMENCLATURE OF END ITEMS

HYDRAULIC TEST STAND - TYPE D5C P/N 74TS1000

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY			(5) TOOLS AND EQUIPMENT	(6) REMARKS
			AVUM	AVIM	DEPOT		
0304	Oil Filter Assembly	Inspect	0.1				
		Service	0.5			102	
		Replace	0.5			102	
0305	Magneto	Inspect	0.1				
		Test		0.5			A
		Adjust		0.5		115	
		Replace		0.6		115	
		Repair		1.0		115	
0306	Careburetor	Inspect	0.1				
		Test		0.5			
		Service	0.3			102	A
		Adjust		0.3		115	
		Replace		1.0		115	
		Repair		1.5		115	
0307	Air Cleaner	Inspect	0.1			102	
		Service	0.3			102	
		Replace	0.5			102	
		Repair	0.5			102	
04	Chassis						
0401	Axle and Steering Assembly	Inspect	0.2				
		Service	0.5			102	
		Repair		1.0			
0402	Wheel Assembly	Inspect	0.1				
		Service	0.5				
		Repair	0.5				
0403	Brake Assembly	Inspect	0.2				
		Service	0.2			102	
		Adjust	0.5			102	
		Repair	0.8			102	
05	Cabinet Assy						
0501	Access Doors, Catches Hinges	Inspect	.3				
		Adjust	.3				
		Repair		1.0		103	

REMARKS

HYDRAULIC TEST STAND TYPE D5C

Reference Code	Remarks
A	Operational test can be performed with component installed on end item.
B	See TB 43-180
C	Use available motor pool tools.

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NO.
100	0	Tool Set, AVUM, Set No. 1	4920-00-159-8727	
101	0	Tool Set, AVUM, Set No. 2	4920-00-567-0476	
102	0	Tool Kit, Aircraft Mechanics, General	5180-00-323-4692	
103	0	Tool Kit, Airframe Repairman	5180-00-323-4876	
104	0	Tool Kit, Hydraulic Repairman	5180-00-323-4891	
105	0	Tool Kit, Prop & Rotor Repairman	5180-00-323-4909	
106	0	Tool Kit, Instrument Repairman	5180-00-323-4913	
107	0	Tool Kit, Electrical Repairman	5180-00-323-4915	
108	0	Tool Kit, Eng Repairman	5180-00-323-4944	
109		Tool Kit, Power Train Repairman	5180-00-003-5267	
110	F	Shop Set, AVIM, Electrical-Instrument	4920-00-165-1453	
111	F	Shop Set, AVIM, Hydraulic	4920-00-165-1454	
112	F	Shop Set, AVIM, Machine Shop	4920-00-405-9279	
113	F	Shop Set, AVIM, Powertrain	4920-00-001-4132	
114	F	Shop Set, AVIM, Propeller Suppl	4920-00-224-3681	

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REFERENCE CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NO.
115	F	Shop Set, AVIM, Recip Eng, Suppl	4920-00-464-0222	
116	F	Shop Set, AVIM, Rotor Shop	4920-00-405-9270	
117	F	Shop Set, AVIM, Sheet Metal	4920-00-166-5505	
118	F	Shop Set, AVIM, Tool Crib	4920-00-224-3684	
119	F	Shop Set, AVIM, Turbine Engine	4920-00-224-3684	
120	F	Shop Set, AVIM, Welding	4920-00-163-5093	

APPENDIX C

REPAIR PARTS AND SPECIAL TOOLS LIST

SECTION I. INTRODUCTION

C-1. Scope. This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of Aviation Unit and Aviation Intermediate maintenance of the Hydraulic Systems Test Stand. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

C-2. General, In addition to Section I, Introduction, this Repair Parts and Special Tools List is divided into the following sections:

a. Section II. Repair Parts List. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materials are listed in item name sequence. Repair parts kits are listed separately in their own functional group within Section II. Repair parts for repairable special tools are also listed in this section. Items listed are shown on the associated illustration (s)/ figure (s).

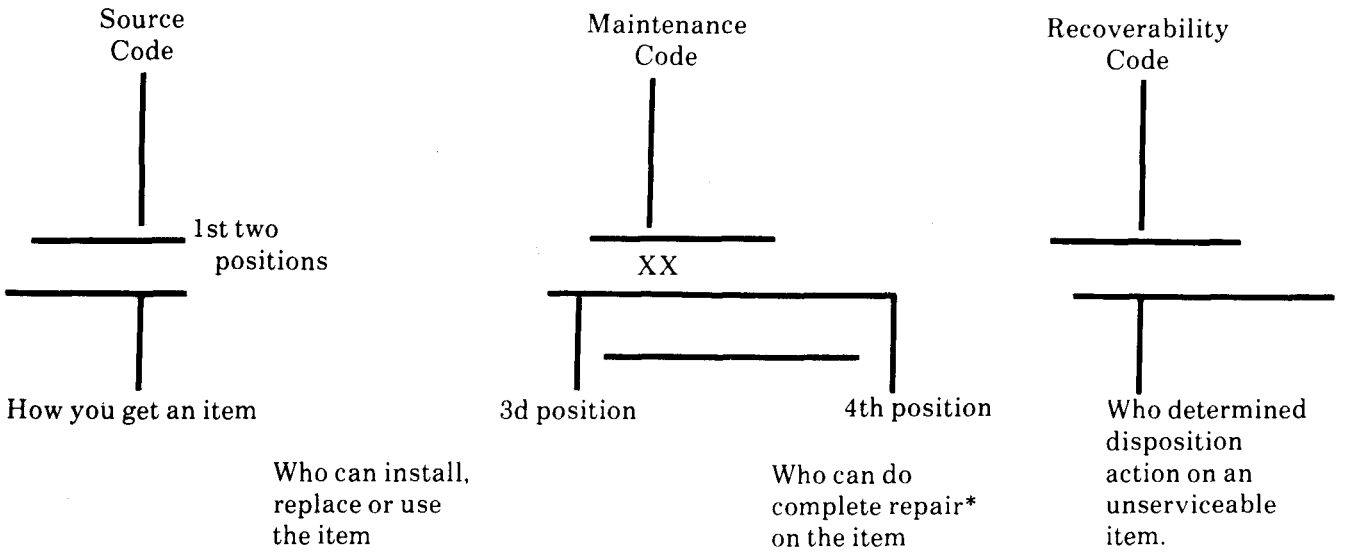
b. Section III. Special Tools List. A list of special tools, special TMDE, and other special support equipment authorized by this RPSTL (as indicated by Basis of Issue (BOI) information in DESCRIPTION AND USUABLE ON CODE column) for the performance of maintenance. (Not applicable).

c. Section IV. National Stock Number and Part Number Index. A list, in National Item Identification Number (NIIN) sequence, of all National stock numbered items appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

C-3. Explanation of Columns (Sections II and III).

a. Item No. (Column (1)). Indicates the number used to identify items called out in the illustration.

b. SMR Code (Column (2)). The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:



*Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair: function in a use/user environment in order to restore serviceability to a failed item.

(1) Source Code. The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item, equipment. Explanations of source codes follows:

Code	Explanation
PA PB PC** PD PE PF PG	Stocked items; use the applicable NSN to request requisition items these source codes. They are authorized to the category indicated by the code entered in the 3d position of the SMR code. **NOTE. Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance category indicated in the 3d position of the SMR code. The complete kit must be requisitioned and applied.

CODE	Explanation
MO- (Made at org/AVUM Level) MF- (Made at DS/AVUM Level) MH- (Made at GS Level) ML- (Made at Specialized Repair Act (SRA)) MD- (Made at Depot)	Items with these codes are not to be requested requisitioned individually. They must be made from bulk material which is identified by the part number in the DESCRIPTION AND USABLE ON CODE (UOC) column and listed in the Bulk Material group of the repair parts list in this RPSTL. If the item is authorized to you by the 3d position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.
AO- (Assembled by rg/AVUM Level) AF- (Assembled by DS/AVIM Level) AH- (Assembled by GS Category) AL- (Assembled by SRA) AD- (Assembled by Depot)	Items with these codes are not to be requested ~ requisitioned individually. The parts that make up these assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicated by the source code. If the 3d position code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher level, order the item from the higher level of maintenance.

XA- Do not requisition an "XA''-coded item. Order its next higher assembly. (Also, refer to the NOTE below.)

XB- If an "XB" item is not availabe from salvage, order it using the FSCM and part number given.

XC- Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD- Item is not stocked. Order an "XD"-coded item through normal supply channels using the FSCM and part number given, if no NSN is available.

NOTE: Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded ''XA" or those aircraft support items restricted by requirements of AR 700-42.

(2) *Maintenance Code.* Maintenance codes tells you the level(s) of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR Code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will in. dicate authorization to one of the following levels of maintenance.

Code	Application Explanation
C	-Crew or operator maintenance done within organizational or aviation unit maintenance.
O	-Organizational or aviation unit category can remove, replace, and use the item.
F	-Direct support or aviation intermediate level can remove, replace, and use the item.
H	-General support level can remove, replace, and use the item.
L	-Specialized repair activity can remove, replace, and use the item.
D	-Depot level can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized repair functions). (NOTE: Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.) This position will contain one of the following maintenance codes.

CODE	Application Explanation
O	-Organizational or (aviation unit) is the lowest level that can do complete repair of the item.
F	-Direct support or aviation intermediate is the lowest level that can do complete repair of the item.
H	-General support is the lowest level that can do complete repair of the item.
L	-Specialized repair activity (designate the specialized repair activity) is the lowest level that can do complete repair of the item.
D	-Depot is the lowest level that can do complete repair of the item.
Z	-Nonreparable. No repair is authorized.
B	-No repair is authorized. (No parts or special tools are authorized for the maintenance of a ‘“B” coded item). However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

(3) *Recoverability Code.* Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability Codes	Application / Explanation
Z	-Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in 3d position of SMR Code.
O	-Reparable item. When uneconomically reparable, condemn and dispose of the item at organizational or aviation unit level.
F	-Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or aviation intermediate level.
H	-Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D	-Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	-Reparable item. Condemnation and disposal not authorized below specialized repair activity (SRA).
A	-Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals directives for specific instructions.

***c. FSCM (Column* (3)).** The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

d. PART NUMBER (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

NOTE: When you use a NSN to requisition an item, the item you receive may have a different part number from the part ordered.

e. DESCRIPTION AND USABLE ON CODE (UOC) (Column (5)). This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The physical security classification of the item is indicated by the parenthetical entry (insert applicable physical security classification abbreviation, e.g., Phy Sec Cl (C) -Confidential, Phy Sec C1 (S) -Secret, Phy Sec Cl -Top Secret).

(3) Items that are included in kits and sets are listed below the name of the kit or set.

(4) Spare repair parts that make up an assembled item are listed immediately following the assembled item line entry.

(5) Part numbers for bulk materials are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC).

(7) The usable on code, when applicable (see paragraph C-5, special information,

(8) In the Special Tools List section, the basis of issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE, and other special support equipment. When density of issue, the total authorization is increased proportionately.

(9) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both Section II and Section III.

f. QTY(Column (6). The QTY (quantity per figure column) indicates the quantity of the item used in the breakdown shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

C-4. Explanation of Columns (Sect. IV)

a. NATIONAL STOCK NUMBER (NSN) INDEX.

(1) STOCK NUMBER Column. This column lists the NSN by National item identification number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN (i.e.. 5305-01-674-1467. When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

NSN

NIIN

(2) FIG. column. This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and Section III.

(3) ITEM column. The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. PART NUMBER INDEX. Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

(1). FSCM column. The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(2) ***PART NUMBER column.*** Indicate the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

(3) STOCK NUMBER column. This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and FSCM columns to the left.

(4) FIG. column. This column lists the number of figure where the item is identified/located in Section II and III.

(5) ITEM column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

C-5. Special Information. Use the following subparagraphs as applicable,

a. USABLE ON CODE. NOT APPLICABLE

b. INDEX NUMBERS. Items which have the word BULK in the figure column will have an index number shown in the item number column. This index number is a cross-reference between the National Stock Number Part Number Index and the bulk material list in Section II.

C-6. How to locate Repair Parts.

a. When National Stock Number or Part Number is Not Known.

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same group.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) Third. Identify the item on the figure and note the item number

(4) Fourth. Refer to the Repair Parts Lists for the figure to find the part number for the item number noted on the figure.

(5) Fifth. Refer to the Part Number Index to find the NSN, if assigned.

b. When National Stock Number or Part Number is Known:

(1) First. Using the Index of National Stock Numbers and Part Numbers, find the pertinent National Stock Number or Part Number. The NSN index is in National Item Identification Number (NIIN) sequence (see C-4a.(l)). The part numbers in the Part Number index are listed in ascending alphanumeric sequence (see C-4.b.). Both indexes cross-reference you to the illustration figure and item number of the item you are looking for.

(2) Second. After finding the figure and item number, verify that the item is the one you're looking for, then locate the item number in the repair parts list for the figure.

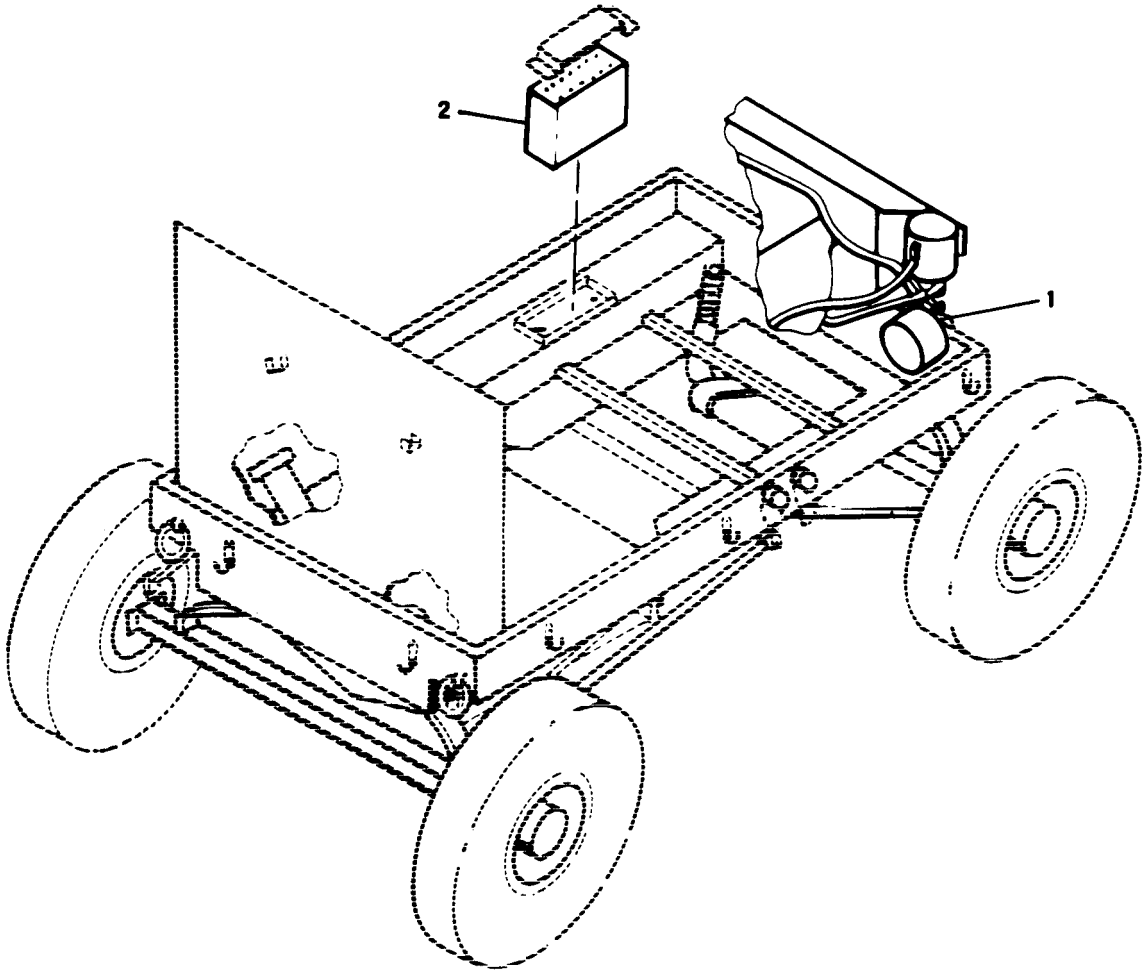


Figure C-1. Alternator and Battery

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 01. ELECTRICAL SYSTEM	
				FIGURE C-1. ALTERNATOR AND BATTERY	
1	PBFZZ	16764	1103164	GENERATOR, ENGINE AC	1
2	PBOZA	96906	MS75047-1	BATTERY,STORAGE STORAGE	1

END OF FIGURE

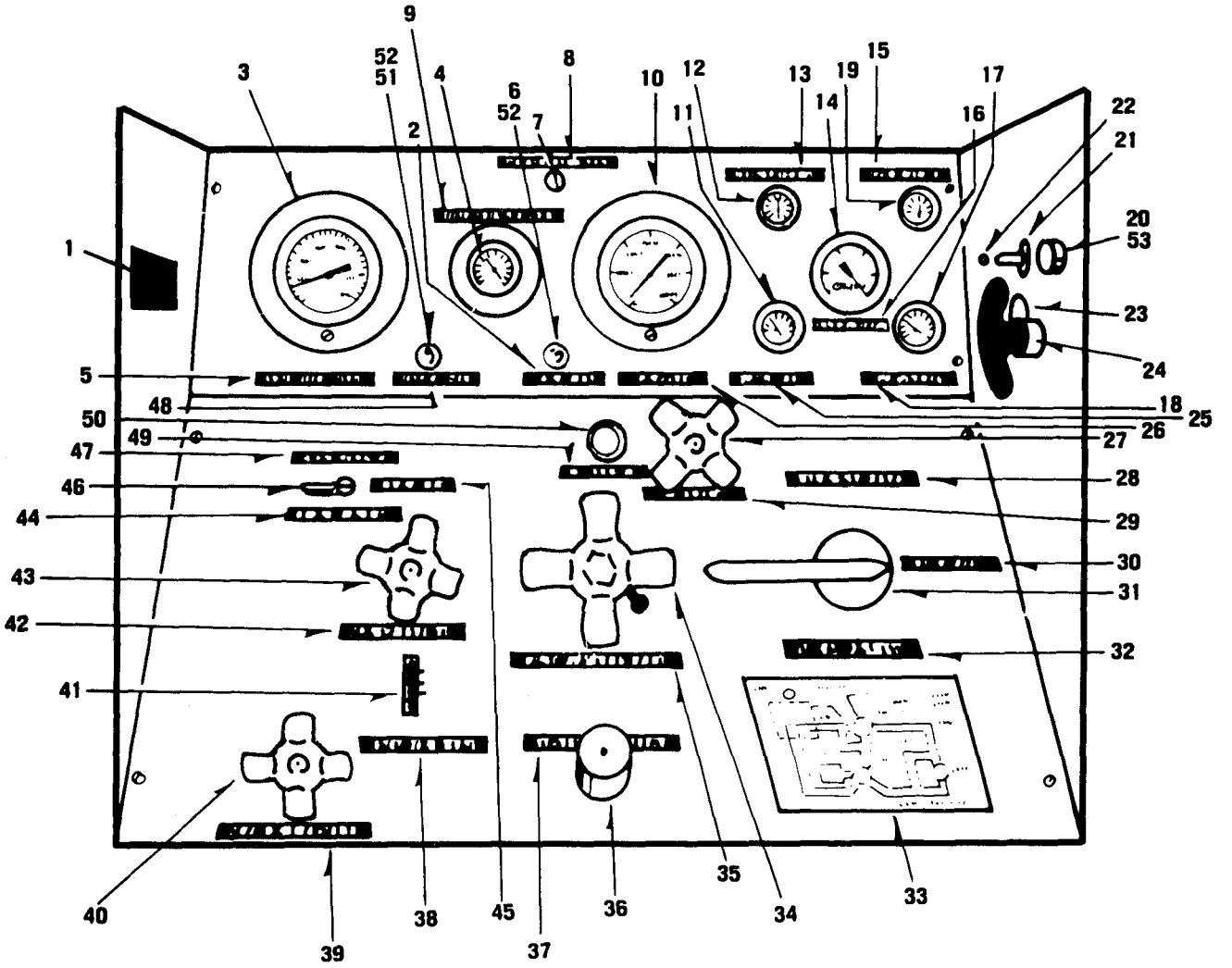


Figure C-2. Control Panel and Instrument Assembly (Front View)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTIONANDUSABLEONCODES(UOC) (UOC)	(6) QTY
				FIGURE C-2. CONTROL PANEL AND INSTRUMENT ASSEMBLY (FRONT VIEW)	
	XDFFF	53155	74-100-51	CONTROL PANEL ASSY	1
1	XDFZZ	53155	7400-1	.NAMEPLATE	1
2	XDFZZ	53155	7400-2	.NAMEPLATE HI HI FILTER	1
3	XDFZZ	72100	176F-33	.GAGE FI FILTER PRESSUR.	1
4	XDFZZ	72100	V-5	.GAGE TEMPERATURE	1
5	XDFZZ	53155	7400-4	.NAMEPLATE FILTER PR	1
6	XDFZZ	72619	806-1710-0431-50	.LIGHT,PRESS WARN HIGH FILTER PRESSURE WARNING	1
7	XDFZZ	30327	832-FS-04	.FITTING GAGE TEST	1
8	XDFZZ	53155	7400-7	.NAMEPLATE GAGE TEST	1
9	XDFZZ	53155	7400-9	.NAMEPLATE FLUID TEM	1
10	XDFZZ	72100	177F-33	.GAGE HI PRESSURE	1
11	PBFZZ	57733	82413	.INDICATOR,LIQUID QU	1
12	XDFZZ	66289	BS-11	.GAGE OIL PRESSURE	1
13	XDFZZ	53155	7400-6	.NAMEPLATE OIL PRESS	1
14	XDFZZ	16764	TH-89	.GAGE TACH HOUR METR	1
15	XDFZZ	53155	7400-10	.NAMEPLATE AMMETER	1
16	XDFZZ	53155	7400-11	.NAMEPLATE TACH-HR	1
17	PBFZZ	57733	82413	.INDICATOR,LIQUID QU	1
18	XDFZZ	53155	7400-12	.NAMEPLATE FLD LVL	1
19	XDFZZ	57733	D-357-X	.AMMETER	1
20	XDFZZ	20954	845-0090	.FUSE,HOLDER	1
21	PBFZZ	53155	76-100-717	.SWITCH,IGNITION	1
22	PBFZZ	66289	YC10C	.SWITCH,PUSH	1
23	PBOZZ	66289	VE693-1	.CONTROL ASSEMBLY,PU	1
24	PBFZZ	66289	VE527	.CONTROL,PUSH-PULL	1
25	XDFZZ	53155	7400-13	.NAMEPLATE FUEL LVL	1
26	XDFZZ	53155	7400-5	.NAMEPLATE FLUID PRS	1
27	XDFZZ	24207	PMFFG-2004	.VALVE FLOW CONTROL	1
28	XDFZZ	53155	7400-14	.NAMEPLATE RETURN	1
29	XDFZZ	53155	7400-22	.NAMEPLATE FLW CNTRL	1
30	XDFZZ	53155	7400-23	.NAMEPLATE RESERVOIR	1
31	PBFZZ	86768	744-20D2	.VALVE,PLUG	1
32	XDFZZ	53155	7400-24	.NAMEPLATE RTN FLW S	1
33	XDFZZ	53155	7400-25	.NAMEPLATE FLW SCHEM	1
34	XDFFF	53155	74-100-177	.VOLUME CNTRL ASSY	1
35	XDFZZ	53155	7400-27	.NAMEPLATE VLME CNTR	1
36	XDFZZ	86768	R-6701-4	.VALVE COMPENSATOR	1
37	XDFZZ	53155	7400-19	.NAMEPLATE HI PRESS	1
38	XDFZZ	53155	7400-20	.NAMEPLATE FLOW IND	1
39	XDFZZ	53155	7400-26	.NAMEPLATE FLD BYPAS	1
40	XDFZZ	24207	PMFFG-2004	.VALVE FLUID BY-PASS	1
41	XDFZZ	53155	74-100-202	.FLOW INDICATOR	1
42	XDFZZ	53155	7400-18	.NAMEPLATE GAGE-OFF	1
43	XDFZZ	24207	PMFFG-2001	.VALVE GAGE SHUT OFF	1
44	XDFZZ	53155	7400-17	.NAMEPLATE FILTER P	1
45	XDFZZ	53155	7400-15	.NAMEPLATE	
46	XDFZZ	30327	108-HD	.VALVE SELECTOR	1
47	XDFZZ	53155	7400-16	.NAMEPLATE INLET	1

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
48	XDFZZ	53155	7400-3	.NAMEPLATE LO FIL WN	1
49	XDFZZ	53155	7400-21	.NAMEPLATE PRES COMP	1
50	XDFZZ	53155	75-100-201	.VALVE,REGULATING FL	1
51	PBFZZ	72619	806-1710-0431-504	.LIGHT,INDICATOR LOW FILTER PRESSURE WARNING.	1
52	PBOZZ	96906	MS25231-313	.LAMP,INCANDESCEN	1
53	PBOZZ	81349	F02A250V5A	.FUSE,CARTRIDGE..	1

END OF FIGURE

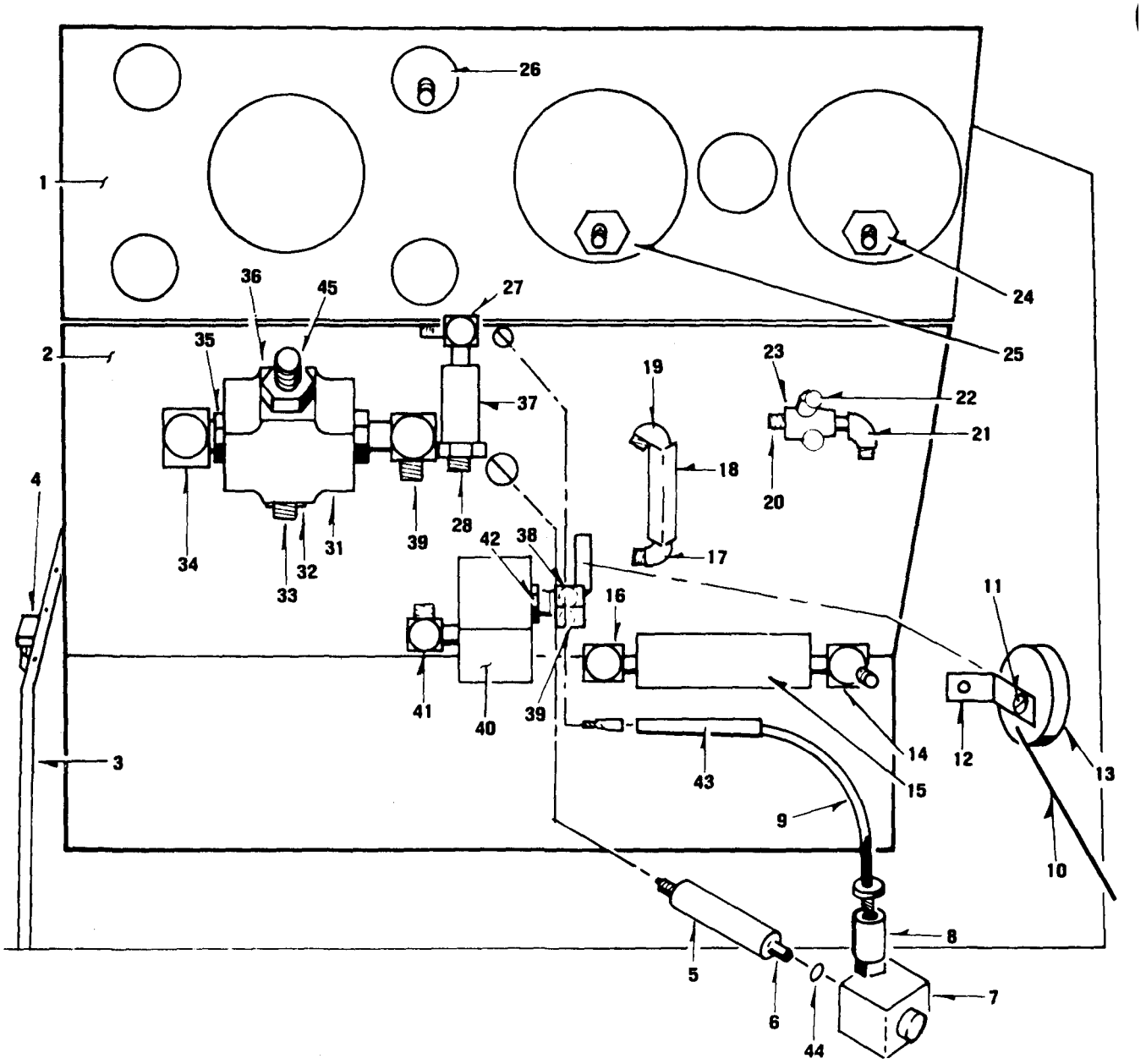


Figure C-3. Control Panel and Instrument Assembly (Back View)

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIGURE C-3. CONTROL PANEL AND INSTRUMENT ASSEMBLY (BACK VIEW)	
1	XDFFF	53155	74-100-51B	INSTRUMENT PANEL	1
2	XDFZZ	53155	74-100-51A	.CONTROL PANEL	1
3	XDFZZ	53155	74-100-69	.SUPPORT HYD RESERV	1
4	PBFZZ	20954	668-2003	.RELAY, STARTER	1
5	XDFZZ	53155	74-100-177-1	.HOUSING CONTROL ROD	1
6	PBFZZ	53155	74-100-177-2	.CONTROL ROD, INSTRUM	1
7	XDFZZ	16954	035-16956	.CAP	1
8	XDFZZ	16954	035-12555	.HOUSING ADJ	1
9	XDFZZ	53155	74-100-201-1	.CABLE COMPENSATOR C	1
10	XDFZZ	53155	74-100-204-3	.ROD, CONTROL	1
11	XDFZZ	88044	AN26-13	.BOLT	1
12	XDFZZ	53155	74-100-202-1	.BRACKET MOUNTING	1
13	XDFZZ	53155	74-100-202-3	.INDICATOR FLOW RATE	1
14	XDFZZ	30327	849FS08X08	.FITTING ELBOW	1
15	XDFZZ	24207	PMFFG-2004	.VALVE,NEEDLE	1
16	XDFZZ	30327	849FS08X08	.FITTING ELBOW	1
17	XDFZZ	30327	849FS04X02	.FITTING ELBOW TUBE	1
18	XDFZZ	24207	PMFFG-2001	.VALVE,NEEDLE	1
19	XDFZZ	30327	849FS04X02	.FITTING ELBOW	1
20	XDFZZ	30327	848FS04X02	.CONNECTOR	1
21	XDFZZ	30327	849FS04X02	.FITTING ELBOW	1
22	XDFZZ	30327	849FS04X02	.FITTING ELBOW	1
23	PBFZZ	30327	108HD1-8	.COCK, PLUG	1
24	XDFZZ	30327	24SB08X04	.BUSHING, PIPE	1
25	XDFZZ	30327	24SG08X04	.FITTING	1
26	XDFZZ	30327	841FS04	.FITTING	1
27	XDFZZ	30327	849FS08X08	.FITTING ELBOW	1
28	XDFZZ	30327	849FS08X08	.FITTING ELBOW	1
29	XDFZZ	30327	849FS16X16	.FITTING ELBOW	1
31	PBFZZ	86768	744-20D2	.VALVE, PLUG	1
32	PBFZZ	88044	AN912-13D	.BUSHING, PIPE	1
33	XDFZZ	30327	854FS12X12	.ELBOW 45	1
34	XDFZZ	30327	854FS12X12	.ELBOW 45 DEGREE	1
35	PBFZZ	88044	AN912-13D	.BUSHING, PIPE	1
36	PBFZZ	88044	AN912-13D	.BUSHING, PIPE	1
37	XDFZZ	24207	PMFFG-2004	.VALVE, NEEDLE	1
38	XDFZZ	30327	849FS08X08	.FITTING	1
39	XDFZZ	30327	849FS08X08	.FITTING	1
40	XDFFF	86768	R6701-4 3/4S2-1/4P	.RELIEF VALVE	1
41	XDFZZ	30327	849FS08X12	.FITTING 90	1
42	PBFZZ	88044	AN912-7D	.BUSHING, PIPE	1
43	PBFZZ	53155	74-100-201-3	.CABLE AND ROD ASSY	1
44	XDFZZ	45681	AN6227-B8	.O' RING	1
45	XDFZZ	30327	848FS12X12	.FITTING	1

END OF FIGURE

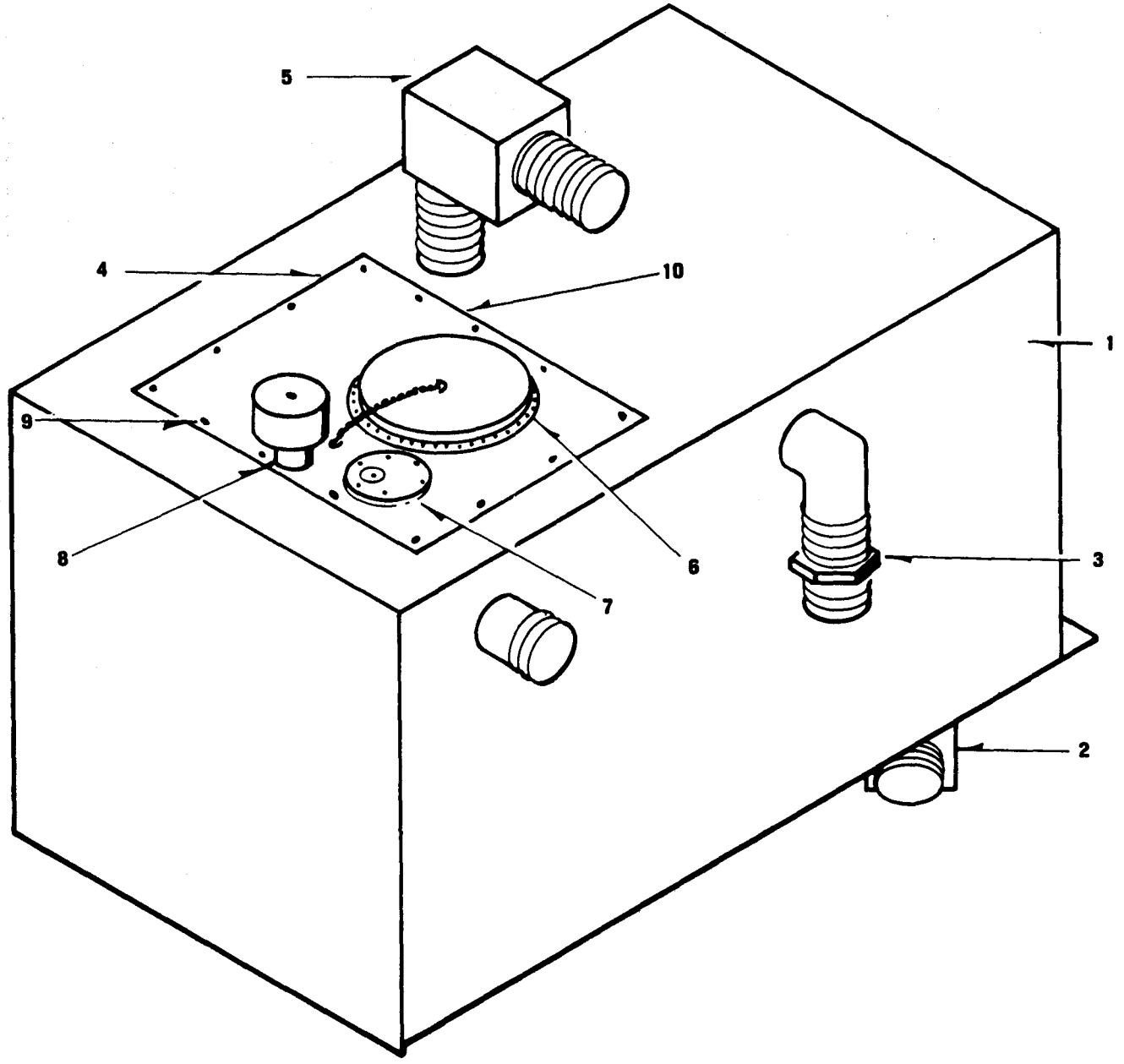


Figure C-4. Reservoir, Hydraulic Tank Assembly

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 02. HYDRAULIC SYSTEM	
				FIGURE C-4. RESERVOIR, HYDRAULIC TANK ASSEMBLY	
1	XDFDD	53155	74-100-13	RESERVOIR HYD TANK.....	1
2	XDFZZ	30327	849FS16X16	.FITTING ELBOW.....	1
3	XDFZZ	30327	848FS12X08	.FITTING ELBOW.....	1
4	XDFZZ	53155	74-100-13-1	.COVER.....	1
5	XDFZZ	30327	849FS12X12	.FITTING ELBOW 90.....	1
6	XDFZZ	86768	751-123	FILLER & LID ASSY.....	1
7	PBFZZ	57733	385-B	.TRANSMITTER,LIQUID.....	1
8	PBFZZ	86768	BF-4	.BREATHER FILTER.....	1
9	XDFZZ	96906	MS35210-71	.SCREW,PAN HD.....	14
10	XDFZZ	53155	74-100-13-2	.GASKET.....	1

END OF FIGURE

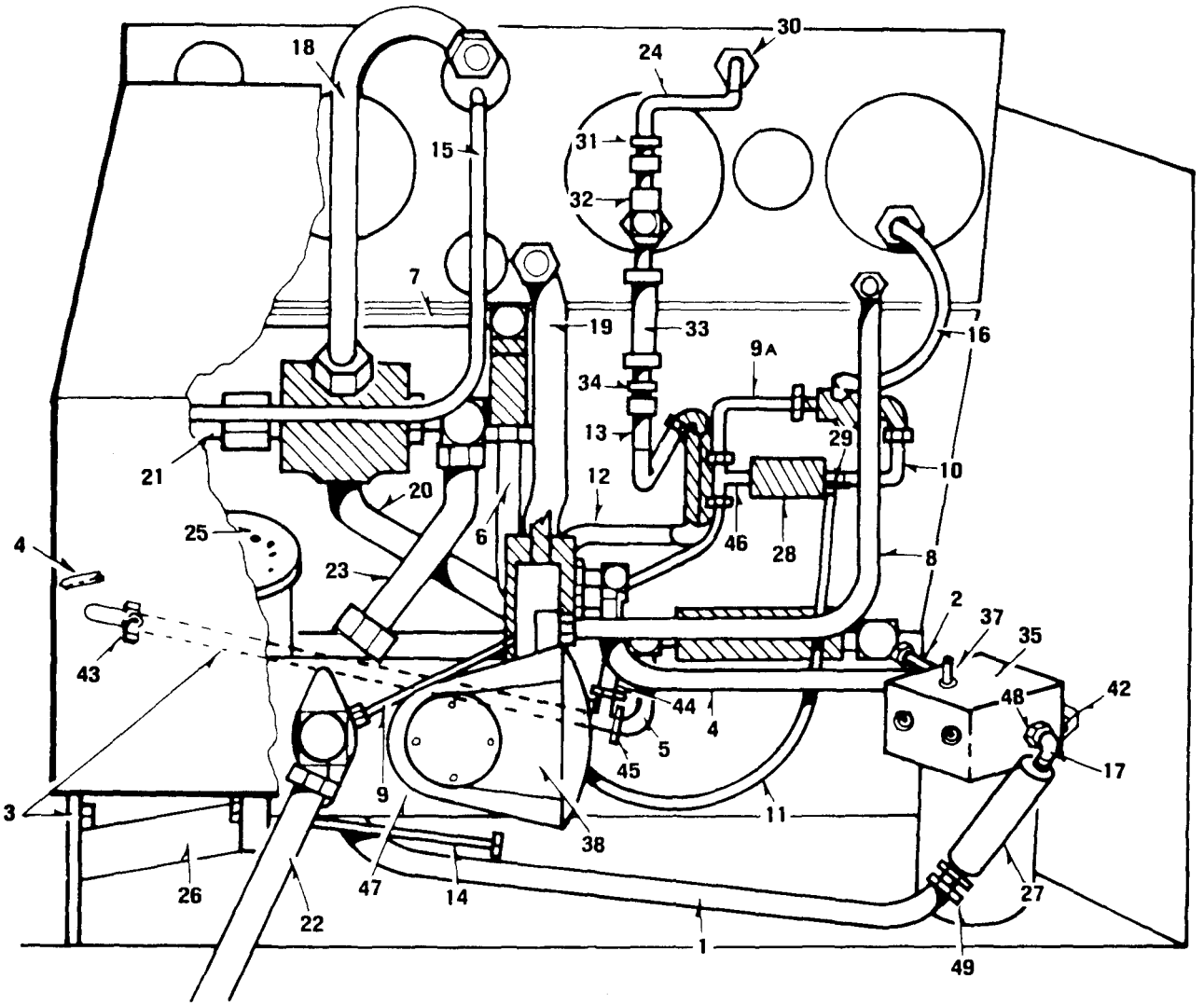


Figure C-5. Plumbing Installation

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIGURE C-5. PLUMBING INSTALLATION	
	XCFZZ	53155	76-400-21	PLUMBING INSTALL	1
1	XDFZZ	53155	74-400-21	.HOSE ASSY	1
2	XDDZZ	53155	74-400-4	.TUBE ASSY HIPRESS	1
3	XDFZZ	53155	74-402-16	.TUBE ASSY	1
4	XDFZZ	53155	74-400-10	.TUBE ASSY	1
5	XDFZZ	53155	74-402-3 3/4	.TUBE ASSY	1
6	XDFZZ	53155	74-400-3	.TUBE ASSY	1
7	XDFZZ	53155	74-400-36	.TUBE ASSY	1
8	XDFZZ	53155	74-400-22	.TUBE ASSY	1
9	XDFZZ	53155	74-401-13	.TUBE ASSY	1
9A	XDFZZ	53155	74-401-7	.TUBE ASSY	1
10	XDFZZ	53155	74-401-9	.TUBE ASSY	1
11	XDFZZ	53155	74-401-17	.TUBE ASSY DIFF	1
12	XDFZZ	53155	74-401-5	.TUBE ASSY	1
13	XDFZZ	53155	74-401-12	.TUBE ASSY	1
14	XDFZZ	53155	74-401-26	.TUBE ASSY	1
15	XDFZZ	53155	74-401-36	.TUBE ASSY	1
16	XDFZZ	53155	74-401-14	.TUBE ASSY	1
17	XDFZZ	97576	8MPE	.FITTING	1
18	XDFZZ	53155	74-402-22	.TUBE ASSY	1
19	XDFZZ	53155	74-402-21	.TUBE ASSY	1
20	XDFZZ	53155	74-402-14	.TUBE ASSY	1
21	XDFZZ	53155	74-402-20	.TUBE ASSY	1
22	XDFZZ	53155	74-403-34	.TUBE ASSY	1
23	XDFZZ	53155	74-403-14	.TUBE ASSY	1
24	XDFZZ	53155	74-401-8	.TUBE ASSY	1
25	XDFDD	53155	74-100-200	.FITER & BRACKET SEE FIG.C-6 FOR BREAKDOWN	1
26	XDFZZ	53155	74-100-9	.ADAPTER	1
27	XDFZZ	53155	453-1/2S2-6	.CHECK VALVE	1
28	XDFZZ	53155	1201-PS-1	.INDICATOR SWITCH	1
29	XDFZZ	30327	851FS02X02	. FITTING TEE	1
30	XDFZZ	30327	832FS04	.BULKHEAD FITTING	1
31	XDFZZ	30327	848FS04X04	.FITTING PIPE TUBE	2
32	XDFZZ	22031	5602	.FITTING	1
33	XDFZZ	86768	694-1/4B	.SNUBBER	1
34	XDFZZ	30327	848FS04X04	.FITTING	1
35	XDOZZ	81321	P-142-16-0	.FILTER, FLUID	1
36	XDFZZ	30327	845FS02X02	. FITTING TEE	1
37	XDFZZ	81321	6681089	.SWITCH PRESSURE	1
38	PBFDD	16954	PV-06J-002-52R-0 YM-000	.PUMP ,HYDRAULI C	1
42	XDFZZ	53155	74-100-54	.BRACKET SPACER	1
43	XDFZZ	30327	883FS012X12	.FITTING	1
44	XDFZZ	53155	74-402-2	.TUBE ASSY	1
45	XDFZZ	30327	844FS08	.FITTING TEE	1
46	XDFZZ	30327	845FS12	.FITTING TEE	1
47	XDFZZ	30327	849FS012X12	.FITTING	1
48	XDFZZ	30327	721FS01	.PLUG	1
49	XDFZZ	30327	848FS12X08	. ADAPTER	1

END OF FIGURE

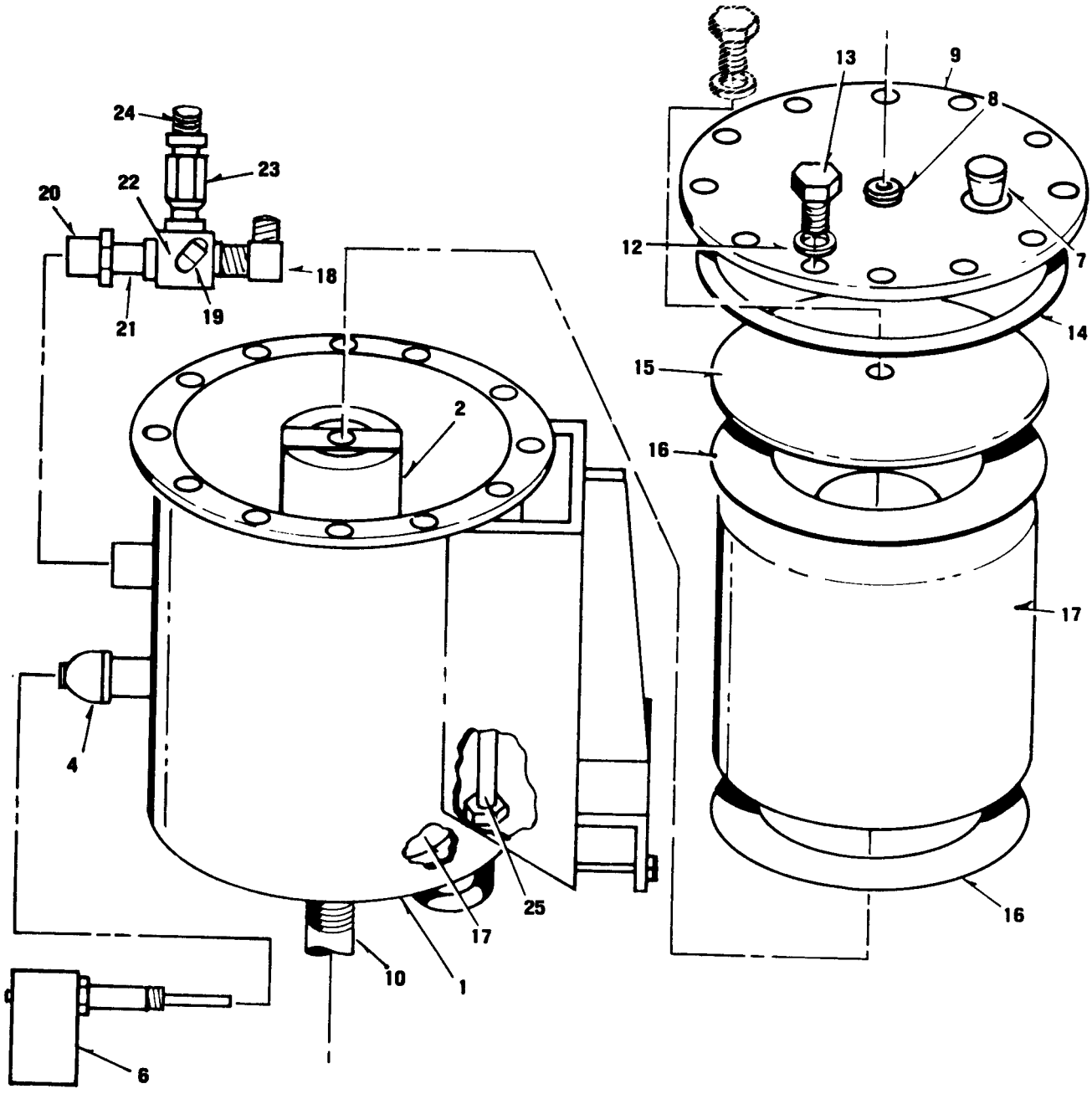


Figure C-6. Filter and Control Assembly

(1) ITEM	(2) SMR	(3)	(4) PART	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIGURE C-6. FILTER AND CONTROL ASSEMBLY	
	XDFFF	53155	74-100-200	FILTER/CONTROL ASSY SEE FIG.C-5 FOR NHA	1
1	XDFZZ	53155	74-100-200-1	.HOUSING FILTER	1
2	XDFZZ	53155	74-100-200-2	.FILTER, ANCHOR ASSY	1
4	PBFZZ	96906	MS39232-7	.REDUCER, PIPE	1
6	XDFZZ	06541	A19ABC	.TEMP CONTROL	1
7	XDFZZ	91510	BJ1000-ASI	PLUG, VENT	1
8	PBFZZ	96906	MS20913-2S	.PLUG, PIPE	2
9	XDFZZ	53155	74-100-200-9	.COVER HOUSING TOP	1
10	XDFZZ	30327	849FS16X16	.FITTING ELBOW	1
12	PBFZZ	96906	MS122032	.WASHER, LOCK	12
13	PBFZZ	96906	MS18154-6	.SCREW, CAP, HEXAGON H	12
14	XDFZZ	45681	2-366	.PACKING, PREFORME D	1
15	XDFZZ	53155	74-100-200-15	.PLATE, ANCHOR FILTER	1
16	XDFZZ	53155	74-100-200-16	.SEAL FILTER	2
17	PBFZZ	81352	AN6236-3	.FILTER ELEMENT, FLUI	1
18	XDFZZ	30327	849FS12X12	.FITTING, ELBOW	1
19	XDFZZ	30327	849FS02X02	.FITTING ELBOW	1
20	PBFZZ	88044	AN912-10D	.BUSHING, PIPE	1
21	PBFZZ	96906	MS51953-97	.NIPPLE, PIPE	1
22	XDFZZ	98660	PF3110-12	.TEE	1
23	XDFZZ	91816	559B-6MP-10	.VALVE CHECK	1
24	XDFZZ	30327	845FS12X12	.ELBOW 45 DEG	1
25	XDFZZ	72100	V-5	.TEMPERATURE GAGE	1

END OF FIGURE

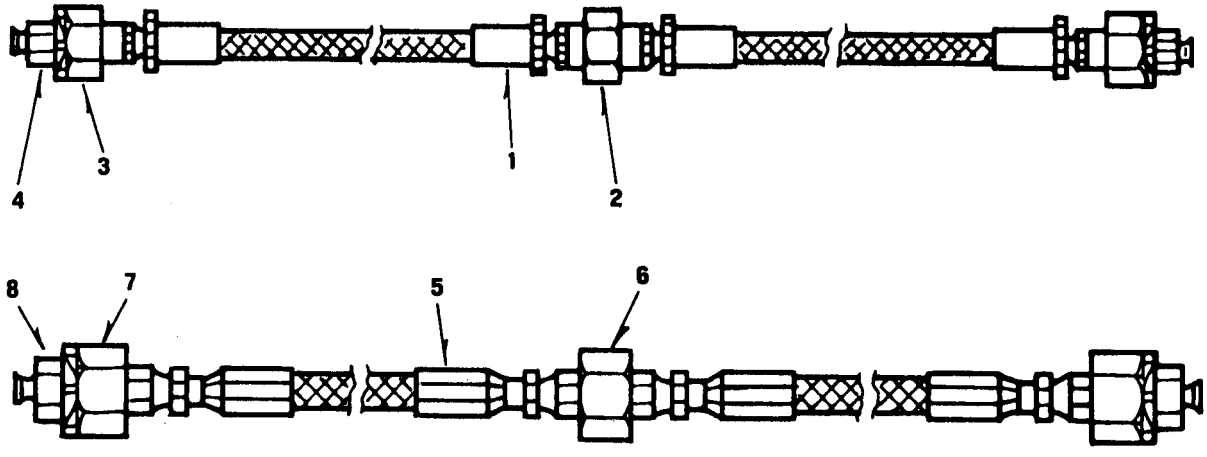


Figure C-7. Hose Assembly

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIGURE C-7. HOSE ASSEMBLY	
	XDFZZ	53155	74TS100-10-1	HOSE ASSEMBLY	1
1	XDFZZ	14798	MS27363H1200	.HOSE	2
2	XDFZZ	14798	AN815-8	.UNION	1
3	XDFZZ	00624	155-S5-8D	.COUPLING HALF, QUICK	2
4	XDFZZ	00624	155-S9-8D	.PLUG, PROTECTIVE, DUS	2
	XDFZZ	53155	74TS100-10-3	HOSE ASSEMBLY	1
5	XDFZZ	96906	MS28741-12-1200	.HOSE	2
6	PBFZZ	96906	MS24392D12	.NIPPLE, TUBE	1
7	XDFZZ	00624	155-S5-12D	.COUPLING	2
8	XDFZZ	00624	155-S9-12D	.PLUG, PROTECTIVE,	2

END OF FIGURE

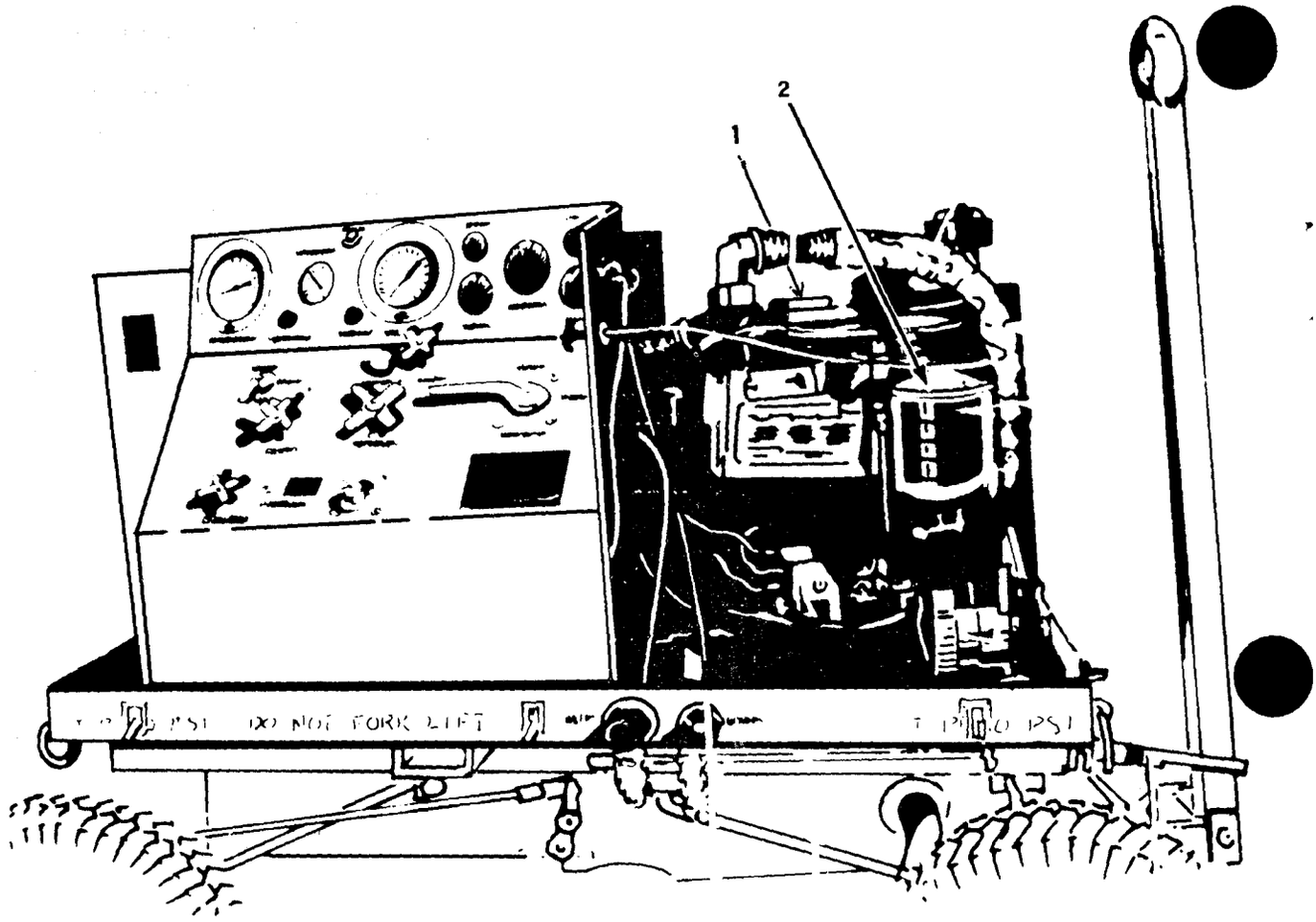


Figure C-8. Engine Compartments

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 03. ENGINE	
				FIGURE C-8. ENGINE COMPARTMENT	
1	PBFDD	66289	MVG-4DSPEC389345	ENGINE,GASOLINE SEE APPENDIX D FOR BREAKDOWN.....	1
2	XDFZZ	16754	S6-AC	.ENGINE OIL FILTER.....	1
				END OF FIGURE	

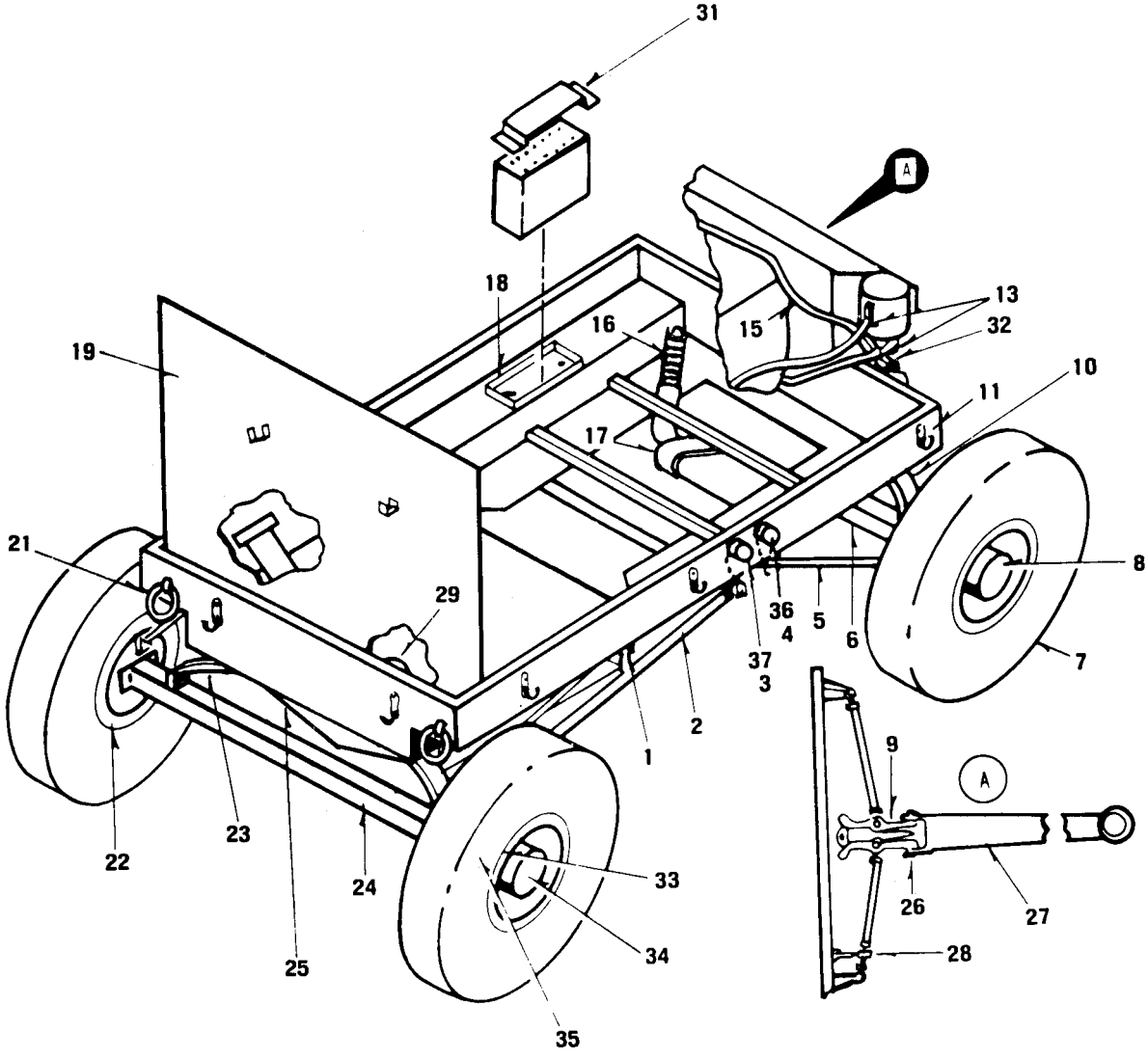


Figure C-9. Lower Chassis Assembly

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 04. CHASSIS	
				FIGURE C-9. LOWER CHASSIS ASSEMBLY	
1	XDFDD	53155	74-100-6	LOWER CHASIS ASSY	1
2	XDFZZ	22938	8300-400M	.BRAKE ROD ASSEMBLY	1
3	PBOZZ	00624	155S11-12D	.COUPLING HALF,SELF-	1
4	XDOZZ	00624	015533S11-8D	.COUPLING HALF,SELF	1
5	XDFZZ	22938	245-5911	.CROSS SHAFT ASSY	1
6	XDFZZ	22938	245-1936	.FRONT AXLE ASSY	1
7	XC	22398	6555	.TIRE & TUBE ASSEMB	4
7	PBOZH	81348	ZZ-T-410A/GP1/6.. 00/6.90-9/C/PLRB	TIRE,PNEUMATIC	4
7	PBOZF	73808	6-00X9	.INNER TUBE,PNEUMATI	4
8	XDFZZ	22938	3712	.WHEEL,PNEUMATIC TIR	4
9	XDFZZ	22938	1-3851	.CENTER ARM ASSY	1
10	XDFZZ	22938	4020-1	.FRONT SPRING ASSY	1
11	PBOZZ	06004	ZLA1008-13	.CLAMP,HOOK	11
13	XDFZZ	53155	74-401-10	.TUBE ASSEMBLY	1
15	XDFZZ	53155	74-401-22	.TUBE ASSEMBLY	1
16	XDFZZ	16764	40004	.EXHAUST TUBE	1
17	PBFZZ	76700	T-5080	.MUFFLER,EXHAUST	1
18	XDFZZ	53155	74-100-602-1	.LOWER BRKT BATTERY	1
19	XDFZZ	53155	74-100-31	.BULKHEAD ASSY	1
21	XDFZZ	98750	48B7796	.RING ASSY,CARGO TIE	4
22	XDFDD	22938	1-8209	.BRAKE DRUM ASSY	2
23	XDFZZ	22938	4020-1	.REAR SPRING ASSY	1
24	XDFDD	22938	245-1346	.REAR AXLE ASSY	1
25	XDFDD	53155	74-100-11	.FUEL TANK SEE FIG.C-10 FOR BREAKDOWN	1
26	XDFZZ	22938	5400-1	.CENTER PIN	1
27	XDFZZ	22938	1-3502	.DRAW BAR	1
28	XDFZZ	22938	1-5904	.BRAKE HANDLE ASSY	1
29	PBFZZ	57733	385-B	.TRANSMITTER,LIQUID	1
31	XDFZZ	53155	74-100-602-3	.BRKT BATTERY HOLDER	1
32	PBOZZ	96906	MS39242-26	.BELT,V	1
33	XDFZZ	60038	2478-1	.INNER BEARING	4
34	XDFZZ	22938	15123	.OUTER BEARING	4
35	XDFZZ	22938	6311	.SEAL,GREASE	4
36	PBFZZ	18876	9081170	.CAP,PROTECTIVE,DUST	1
37	PBFZZ	00624	155S7-12D	.CAP,QUICK DISCONNEC	1

END OF FIGURE

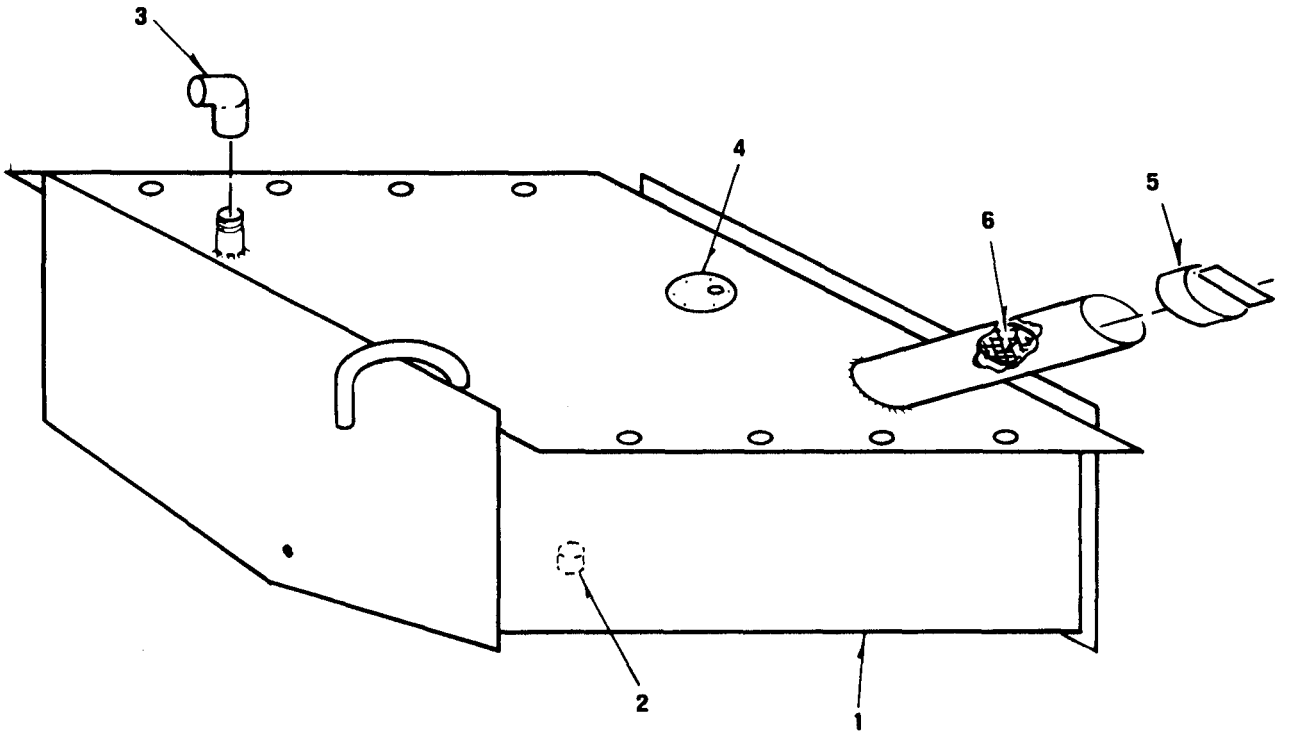


Figure C-10. Tank, Fuel Gasoline

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				FIGURE C-10. TANK, FUEL GASOLINE	
1	XDFFF	53155	74-100-11	TANK,FUEL SEE FIG.C-9 FOR NHA	1
2	PBFZZ	96906	MS20913-4S	.PLUG,PIPE	1
3	XDFZZ	30327	50F	.ELBOW	1
4	XDOFZ	57733	385-B	.TRANSMITTER,LIQUID	1
5	XDFZZ	53155	74-100-11-1	.CAP,FUEL TANK	1
6	XDFZZ	53155	74-100-11-2	.STRAINER	1
				END OF FIGURE	

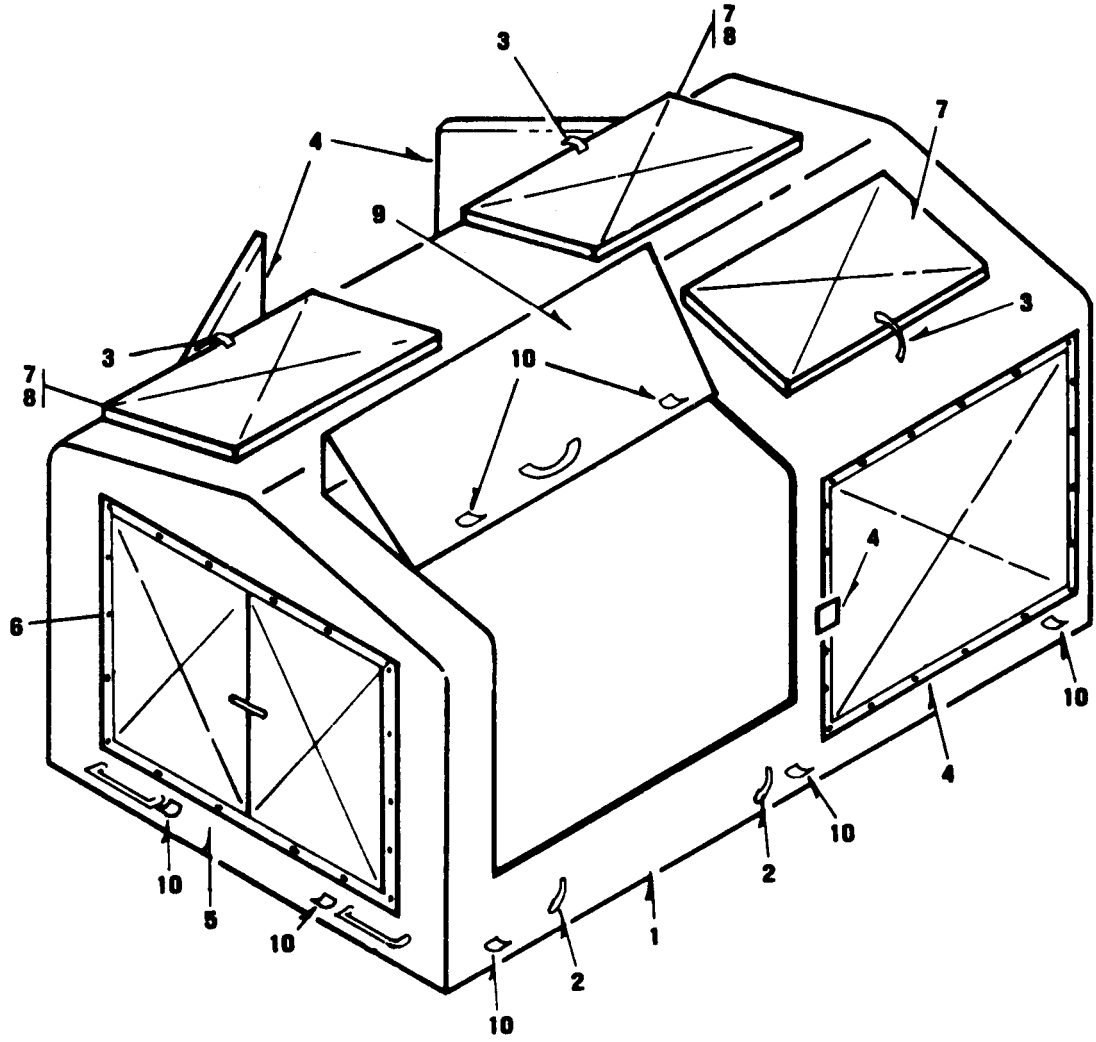


Figure C-11. Housing and Door Assembly

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 05. CABINET ASSY	
				FIGURE C-11. HOUSING AND DOOR ASSEMBLY	
1	XDOFF	53155	74-100-8	HOUSING,DOOR ASSY.....	1
2	XDOZZ	06004	HS11-ZL-1042-12	.STRIKE.....	10
3	XDOZZ	06004	ZLA-1202-13	.LATCH DOOR.....	5
4	XDOFF	53155	74-100-8-1	.FRAME & DOOR ASSY.....	3
5	XDOFF	53155	74-100-8-2	.FRAME & DOOR ASSY.....	1
6	XDFFF	53155	74-100-2	..R&L ACCESS DOOR.....	1
7	XDOFF	53155	74-100-8-3	.DOOR ASSY TOP ACCES.....	3
8	XDFFZ	53155	74-100-1	..DOOR,ACCESS HYDRAULIC RESERVOIR..	1
9	XDOFF	53155	74-100-8-4	.DOOR ASSY,INSTR.....	1
10	XDOZZ	06004	ZLA1008-13	.CLAMP,HOOK.....	10
				END OF FIGURE	

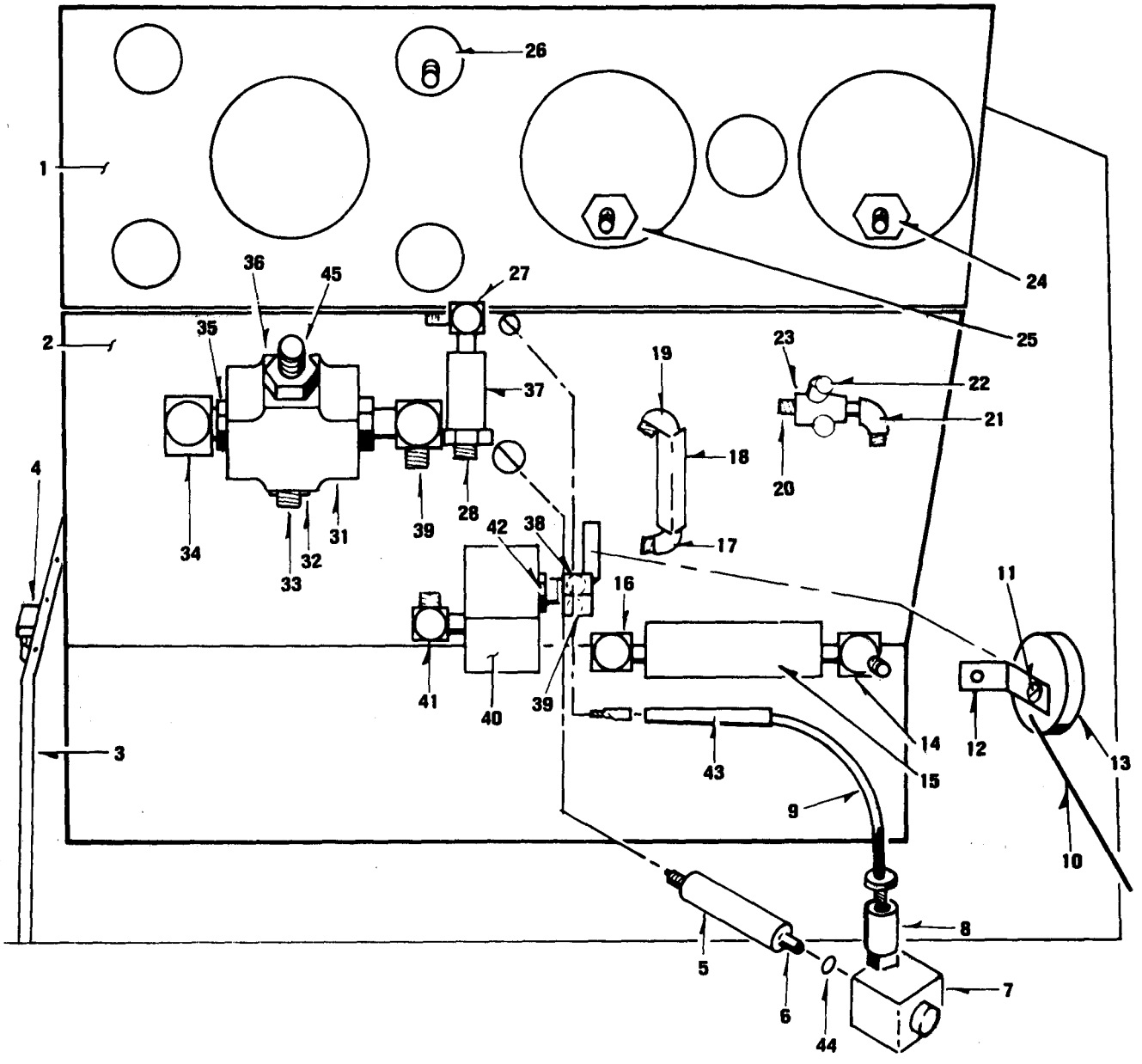


Figure C-3. Control Panel and Instrument Assembly (Back View)

(1) ILLUSTRATION (a) FIG NO	(1) ILLUSTRATION (b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
C-3	1	XDFFF		53155	74-1CC-518	INSTRUMENTPANEL	EA	1
C-3	2	XDFZZ		53155	74-1CC-51A	.CONTROLPANEL	EA	1
C-3	3	XDFZZ		53155	74-1CC-69	.SUPPORTHYDRESERV	EA	1
C-3	4	PBFZZ		2C954	668-2303	.RELAY,STARTER	EA	1
C-3	5	XDFZZ		53155	74-1CC-177-1	.HOUSINGCONTROLROD	EA	1
C-3	6	XDFZZ		53155	74-1CC-177-2	.CONTROLROD	EA	1
C-3	7	XDFZZ		16954	035-16556	.CAP	EA	1
C-3	8	XDFZZ		16954	035-12555	.HOUSINGADJ	EA	1
C-3	9	XDFZZ		53155	74-1CC-201-1	.CABLECOMPENSCONTR	EA	1
C-3	10	XDFZZ		53155	74-1CC-204-3	.ROD,CONTROL	EA	1
C-3	11	XDFZZ		88044	AN26-13	.BOLT	EA	1
C-3	12	XDFZZ		53155	74-1CC-202-1	.BRACKETMOUNTING	EA	1
C-3	13	XDFZZ		53155	74-1CC-202-3	.INDICATORFLOWRATE	EA	1
C-3	14	XDFZZ		3C327	849FSCFX08	.FITTINGELBOW	EA	1
C-3	15	XDFZZ		24207	FMFFG-2004	.VALVE,NEEDLE	EA	1
C-3	16	XDFZZ		3C327	849FSC8X08	.FITTINGELBOW	EA	1
C-3	17	XDFZZ		3C327	849FSC4X02	.FITTINGELBOWTUBE	EA	1
C-3	18	XDFZZ		24207	FMFFG-2001	.VALVE,NEEDLE	EA	1
C-3	19	XDFZZ		3C327	849FSC4X02	.FITTINGELBOW	EA	1
C-3	20	XDFZZ		3C327	848FSC4X02	.CONNECTOR	EA	1
C-3	21	XDFZZ		3C327	849FSC4X02	.FITTINGELBOW	EA	1
C-3	22	XDFZZ		3C327	849FSC4X02	.FITTINGELBOW	EA	1
C-3	23	PBFZZ	2805-00-695-1029	3C327	108HC1-8	.VALVESELECTOR	EA	1
C-3	24	XDFZZ		3C327	245BC8X04	.FITTING	EA	1
C-3	25	XDFZZ		3C327	245G08X04	.FITTING	EA	1
C-3	26	XDFZZ		3C327	841FSC4	.FITTING	EA	1
C-3	27	XDFZZ		3C327	849FSC8X08	.FITTINGELBOW	EA	1
C-3	28	XDFZZ		3C327	849FSC8X08	.FITTINGELBOW	EA	1
C-3	29	XDFZZ		3C327	849FS16X16	.FITTINGELBOW	EA	1
C-3	31	PBFZZ	4820-00-927-7199	66766	744-2002	.VALVE,PLUG	EA	1
C-3	32	PBFZZ	4730-00-194-0225	88044	AN912-13D	.BUSHING,REDUCER	EA	1
C-3	33	XDFZZ		3C327	854FS12X12	.ELBOW45	EA	1
C-3	34	XDFZZ		3C327	854FS12X12	.ELBOW45DEGREE	EA	1
C-3	35	PBFZZ	4730-00-194-0225	88044	AN912-13D	.BUSHING,PIPE	EA	1
C-3	36	PBFZZ	4730-00-194-0225	88044	AN912-13D	.BUSHING,REDUCER	EA	1
C-3	37	XDFZZ		24207	FMFFG-2004	.VALVE,NEEDLE	EA	1
C-3	38	XDFZZ		3C327	849FSC8X08	.FITTING	EA	1
C-3	39	XDFZZ		30327	849FSC8X08	.FITTING	EA	1
C-3	40	XDFFF		66766	R6701-43/4 S2-1/4P	.RELIEFVALVE	EA	1

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION USABLE ON CODE	(7) A	(8) QTY INC IN UNIT
C-3	41	OFZZ		1C327	B49FS(8X12	.FITTING 90	A	1
C-3	42	BFZZ	4730-00-194-0211	1E044	AN912-7D	.BUSHING,PIPE	A	1
C-3	43	OFZZ		13191	74-1CC-2J1-3	.CABLE GUIDE	A	1
C-3	44	OFZZ		15681	AN6227-B8	.O'RING	A	1
C-3	45	OFZZ		1C327	B48FS12X12	.FITTING	A	1

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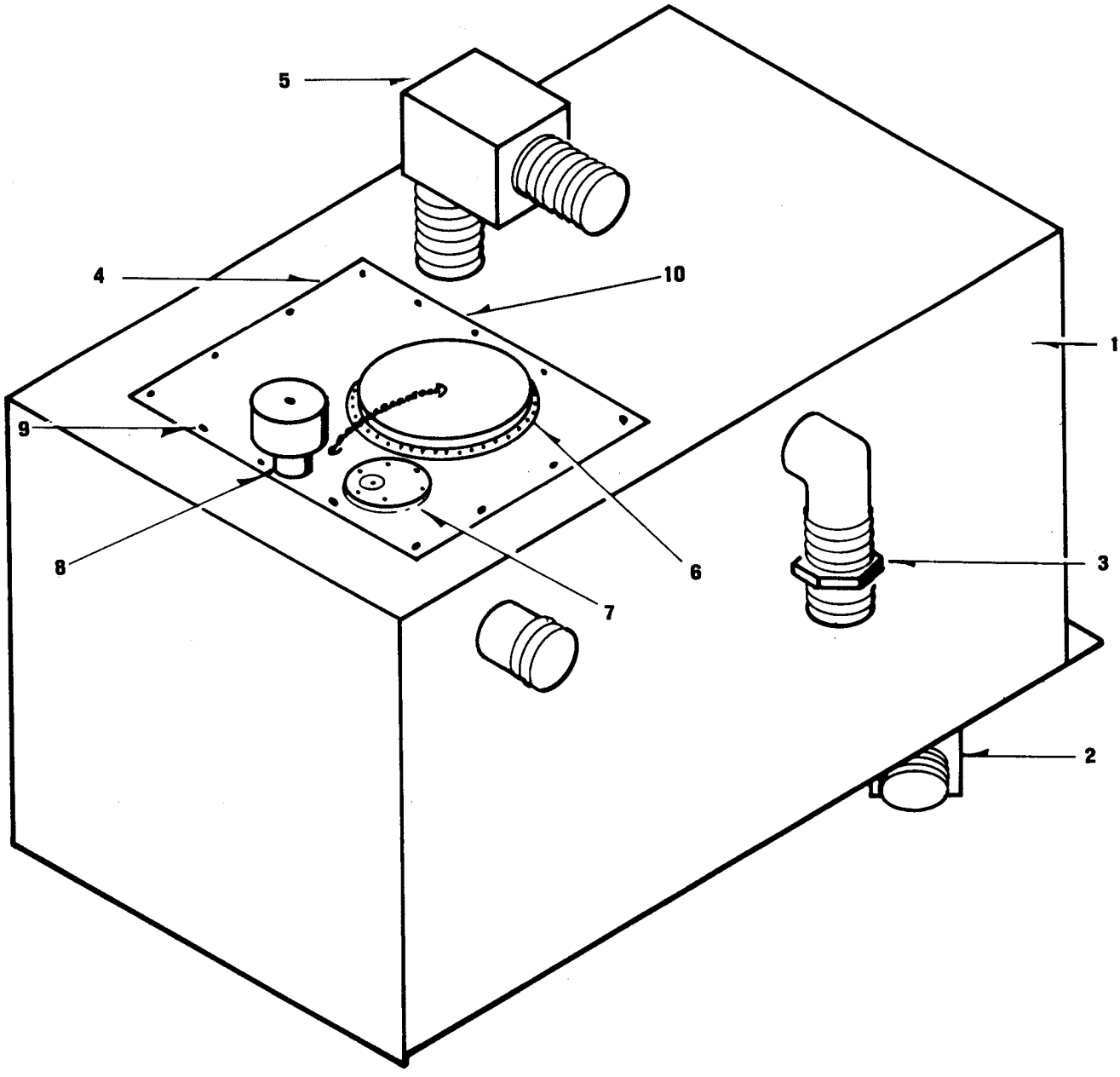

Figure C-4. Reservoir, Hydraulic Tank Assembly

(1) ILLUSTRATION (a) FIG NO	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK	(4)	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	(7) /M	(8) QTY INC IN UNIT
						GROUP C2 HYDRAULIC SYSTEM		
C-4		XDFCD		5315	74-100-13	RESERVOIR,HYD TANK	A	1
C-4		XDFZZ		3C32	845FS16X16	.FITTING,ELBOW	A	1
C-4		XDFZZ		3C32	848FS12X08	.FITTING,ELBOW	A	1
C-4		XDFZZ		5315	74-100-13-1	.COVER	A	1
C-4		XDFZZ		3C32	845FS12X12	.FITTING,ELBOW,90 DEG	A	1
C-4		XDFZZ		E676	751-123	FILLER & LID ASSY	A	1
C-4		PBFCD	5680-00-435-422	5773	385-8	.TRANSMITTER,LIQUID	A	1
C-4		PBFZZ		E676	BF-4	.BREATHER FILTER	A	1
C-4		XDFZZ		E690	MS35210-71	.SCREW,PAN HD	A	14
C-4	11	XDFZZ		5315	74-100-13-2	.GASKET	A	1

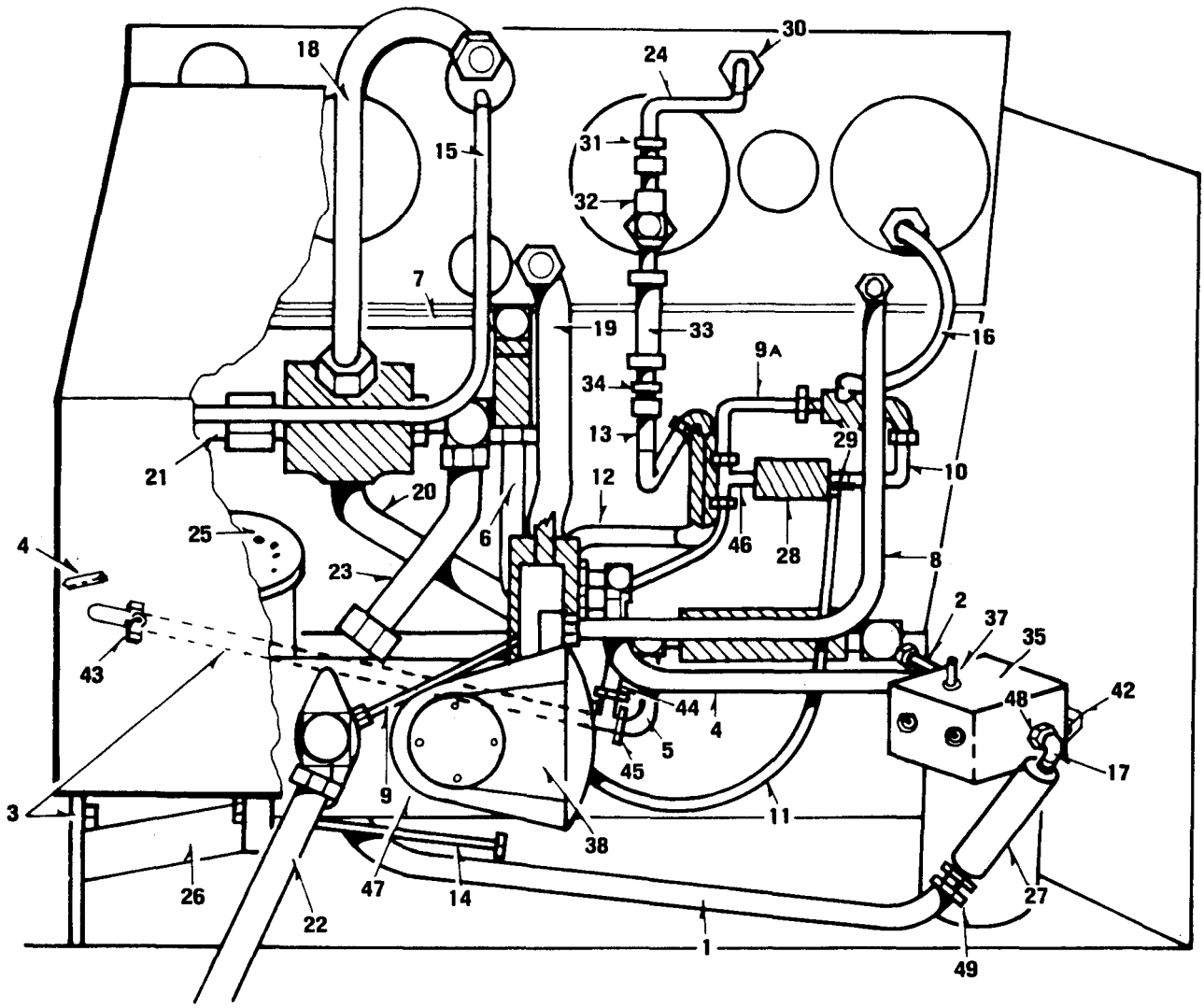

Figure C-5. Plumbing Installation

(1) ILLUSTRATION (a) FIG NO	(b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION USABLE ON CODE	(7) U/I	(8) QTY INC IN UNIT
C-5	1	XDFZZ		83155	74-400-21	.HOSE ASSY	EA	1
C-5	2	XDDZZ		83155	74-400-4	.TUBE ASSY,HIPRESS	EA	1
C-5	3	XDFZZ		83155	74-402-16	.TUBE ASSY	EA	1
C-5	4	XDFZZ		83155	74-400-10	.TUBE ASSY	EA	1
C-5	5	XDFZZ		83155	74-402-3 3/4	.TUBE ASSY	EA	1
C-5	6	XDFZZ		83155	74-400-3	.TUBE ASSY	EA	1
C-5	7	XDFZZ		83155	74-400-36	.TUBE ASSY	EA	1
C-5	8	XDFZZ		83155	74-400-22	.TUBE ASSY	EA	1
C-5	9	XDFZZ		83155	74-401-13	.TUBE ASSY	EA	1
C-5	9A	XDFZZ		83155	74-401-7	.TUBE ASSY	EA	1
C-5	10	XDFZZ		83155	74-401-9	.TUBE ASSY	EA	1
C-5	11	XDFZZ		83155	74-401-17	.TUBE ASSY,DIFF	EA	1
C-5	12	XDFZZ		83155	74-401-5	.TUBE ASSY	EA	1
C-5	13	XDFZZ		83155	74-401-12	.TUBE ASSY	EA	1
C-5	14	XDFZZ		83155	74-401-26	.TUBE ASSY	EA	1
C-5	15	XDFZZ		83155	74-401-36	.TUBE ASSY	EA	1
C-5	16	XDFZZ		83155	74-401-14	.TUBE ASSY	EA	1
C-5	17	XDFZZ		97976	8W88	.FITTING	EA	1
C-5	18	XDFZZ		83155	74-402-22	.TUBEASSY	EA	1
C-5	19	XDFZZ		83155	74-402-21	.TUBEASSY	EA	1
C-5	20	XDFZZ		83155	74-402-14	.TUBE ASSY	EA	1
C-5	21	XDFZZ		83155	74-402-20	.TUBE ASSY	EA	1
C-5	22	XDFZZ		83155	74-403-34	.TUBE ASSY	EA	1
C-5	23	XDFZZ		83155	74-402-14	.TUBEASSY	EA	1
C-5	24	XDFZZ		83155	74-401-8	.TUBEASSY	EA	1
C-5	25	XDFDD		83155	74-100-200	.FITER & BRACKET SEEFIG.C-6FORBREAKDOWN	EA	1
C-5	26	XDFZZ		83155	74-100-9	.ADAPTER	EA	1
C-5	27	XDFZZ		83155	453-1/2S2-6	.CHECKVALVE	EA	1
C-5	28	XDFZZ		83155	1201-FS-1	.INDICATORSWITCH	EA	1
C-5	29	XDFZZ		30327	851FS02X02	.FITTINGTEE	EA	1
C-5	30	XDFZZ		30327	832FSC4	.BULKHEADFITTING	EA	1
C-5	31	XDFZZ		30327	848FSC4X04	.FITTINGPIPETUBE	EA	2
C-5	32	XDFZZ		22031	5602	.FITTINGS	EA	1
C-5	33	XDFZZ		66768	694-1/4B	.SNUBBER	EA	1
C-5	34	XDFZZ		30327	848FSC4X04	.FITTING	EA	1
C-5	35	XDDZZ		81321	P-142-16-3	.FILTER,HIPRESSURE		1
C-5	36	XDFZZ		30327	845FSC2X02	.FITTING TEE		1
C-5	37	XDFZZ		81321	6681089	.SWITCHPRESSURE		1
C-5	38	PBFDD		16954	PV-063-D02-52R-C YM-CCC	.PUMPHYDRAULIC		1

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	(7) I/I	(8) QTY INC IN UNIT
C-5	4	(DFZZ		9315	14-100-54	.BRACKETSPACER	A	1
C-5	4	(DFZZ		3C32	183FSC12X12	.FITTING	A	1
C-5	4	(DFZZ		9315	14-4C2-2	.TUBEASSY	A	1
C-5	4	(DFZZ		3C32	144FSC8	.FITTINGTEE	A	1
C-5	4	(DFZZ		3C32	145FS12	.FITTING TEE	A	1
C-5	4	(DFZZ		3C32	149FSC12X12	.FITTING	A	1
C-5	4	(DFZZ		3C32	121FSC1	.PLUG	A	1
C-5	4	(DFZZ		3C32	148FS12X08	.ADAPTER	A	1

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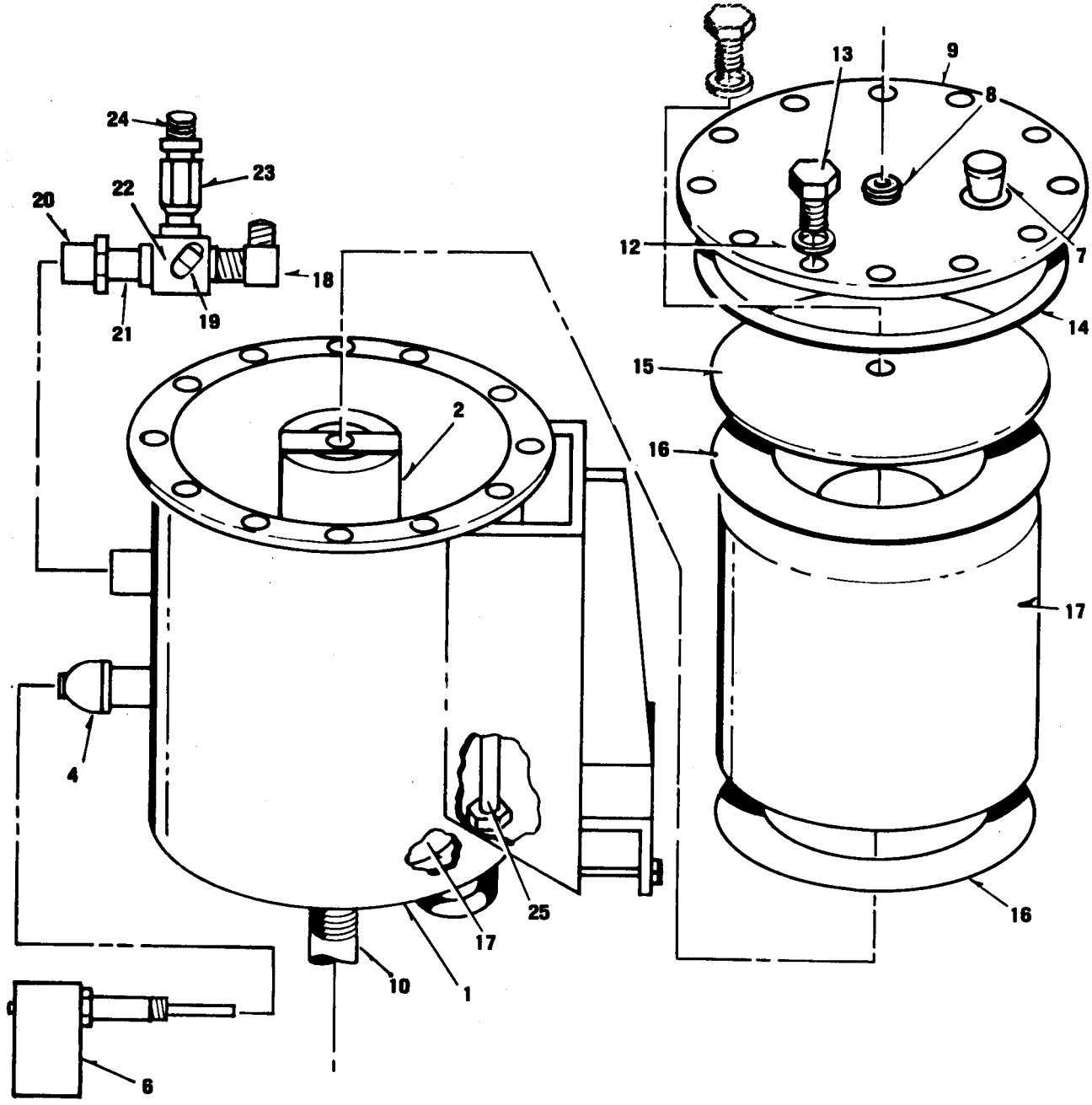


Figure C-6. Filter and Control Assembly

(1) ILLUSTRATION (a) FIG NO	(1) ILLUSTRATION (b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) USABLE ON CODE	(7) I/I	(8) QTY INC IN UNIT
C-6		XDFFF		53155	74-1CC-200	FILTER/CONTROL ASSY SEE FIG.C-5 FOR NHA	A	1
C-6		XDFZZ		53155	74-1CC-200-1	.HOUSING FILTER	A	1
C-6		XDFZZ		53155	74-1CC-200-2	.FILTER,ANCHOR ASSY	A	1
C-6		PBFZZ	4730-00-221-565	96906	MS39232-7	.REDUCER,PIPE	A	1
C-6		XDFZZ		06541	A15ABC	.TEMP CONTROL	A	1
C-6		XDFZZ		51510	BJ10CC-ASI	.PLUG,VENT	A	1
C-6		PBFZZ	4730-00-221-213	96906	MS20913-2S	.PLUG,PIPE	A	2
C-6		XDFZZ		53155	74-1CC-200-9	.COVER HOUSING TOP	A	1
C-6	1	XDFZZ		3C327	845FS16X16	.FITTING ELBOW	A	1
C-6	1	PBFZZ	5310-00-159-620	96906	MS122032	.WASHER,LOCK 1/4	A	12
C-6	1	PBFZZ	5305-00-914-378	96906	MS18154-6	.SCREW,CAP,HEX ASCNH	A	12
C-6	1	XDFZZ		45681	2-366	.PACKING,PREFORMED	A	1
C-6	1	XDFZZ		53155	74-1CC-200-15	.PLATE,ANCHOR FILTER	A	1
C-6	1	XDFZZ		53155	74-1CC-200-16	.SEAL FILTER	A	2
C-6	1	PBFZZ	4330-00-804-154	81321	30316-20	.FILTER ELEMENT,FLUI	A	1
C-6	1	XDFZZ		3C327	845FS12X12	.FITTING,ELBOW	A	1
C-6	1	XDFZZ		3C327	845FSC2X02	.FITTING ELBOW	A	1
C-6	2	PBFZZ	4730-00-154-021	88044	AN912-10C	.BUSHING,REDUCER	A	1
C-6	2	PBFZZ	4730-00-156-146	96906	MS51953-97	.NIPPLE,PIPE	A	1
C-6	2	XDFZZ		58660	PF311C-12	.TEE	A	1
C-6	2	XDFZZ		51816	5558-6MP-10	.VALVE CHECK	A	1
C-6	2	XDFZZ		3C327	845FS12X12	ELBOW 45 DEG	A	1
C-6	2	XDFZZ		72100	V-5	.TEMPERATURE CAGE	A	1

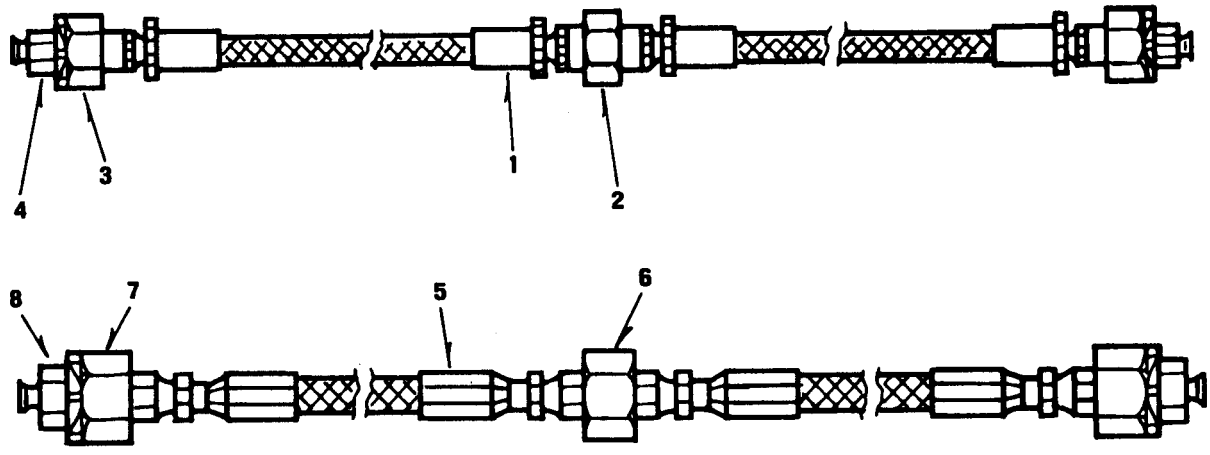


Figure C-7. Hose Assembly

(1) ILLUSTRATION (a) FIG NO	(1) ILLUSTRATION (b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	U/M	(8) QTY INC IN UNIT
C-7		XDFZZ		83159	74TS100-10-1	HOSE ASSEMBLY	EA	1
C-7		XDFZZ		14799	MS27363H1200	.HOSE	EA	2
C-7		XDFZZ	4730-00-187-0481	14799	AN815-8	.UNION	EA	1
C-7		XDFZZ		00624	155-99-80	.COUPLING	EA	2
C-7		XDFZZ		00624	155-99-80	.PLUG	EA	2
C-7		XDFZZ		83159	74TS100-10-3	HOSE ASSEMBLY	EA	1
C-7		XDFZZ		96906	MS28741-12-1200	.HOSE	EA	2
C-7		PBFZZ	4730-00-188-9683	96906	MS24392D12	.UNION	EA	1
C-7		XDFZZ		00624	155-99-120	.COUPLING	EA	2
C-7		XDFZZ		00624	155-99-120	.PLUG	EA	2

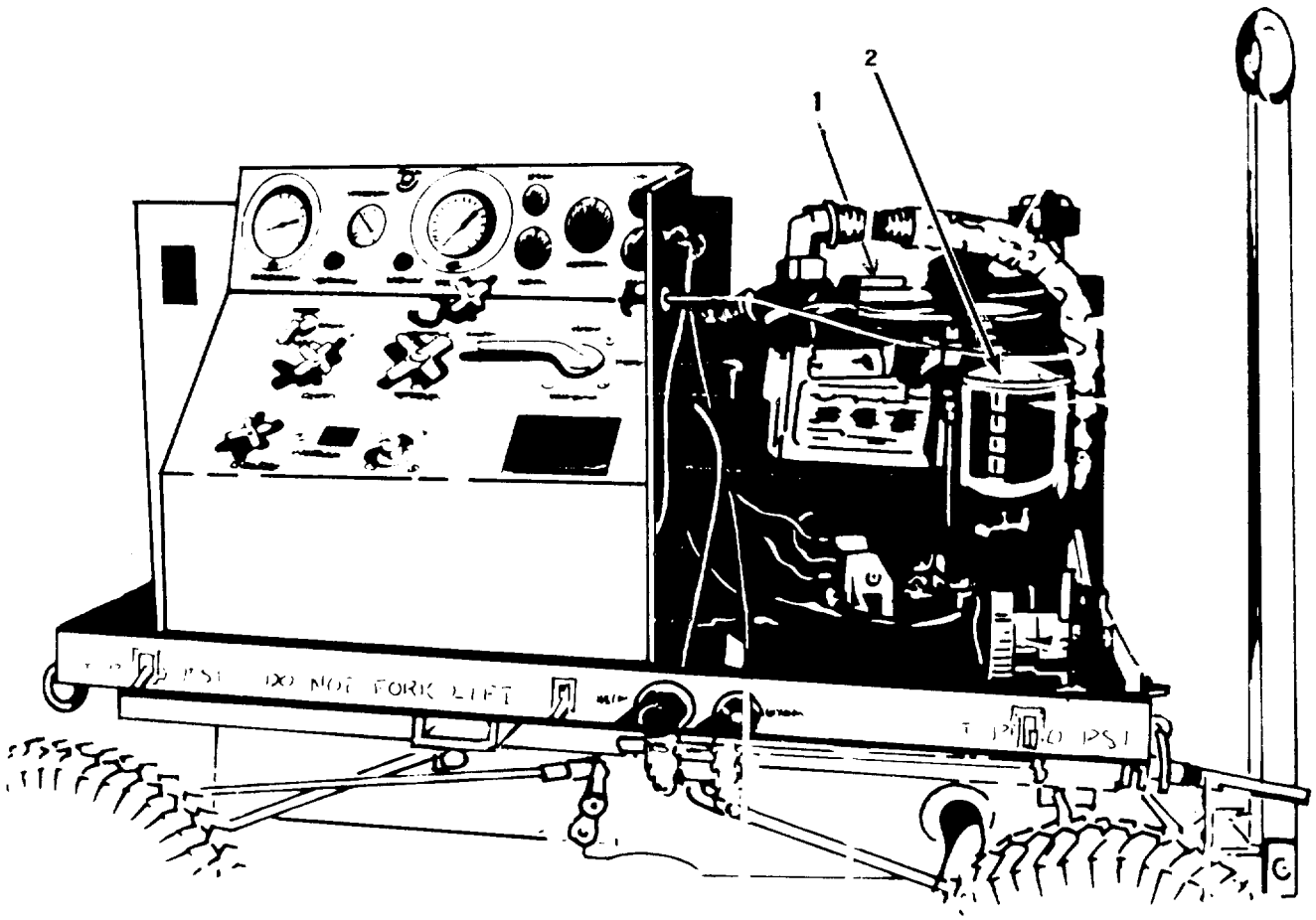


Figure C-8. Engine Compartment

(1) ILLUSTRATIO (a) FIG NO	(b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						GROUP 03 ENGINE		
C-8		PBFDD		28050	MVG-4(SPEC) 8934	ENGINE,GASOLINE SEE APPENDIX D FOR BREAKDOWN.....	EA	1
C-8		XDFZZ		16754	S6-A C	.ENGINE OIL FILTER.....	EA	1

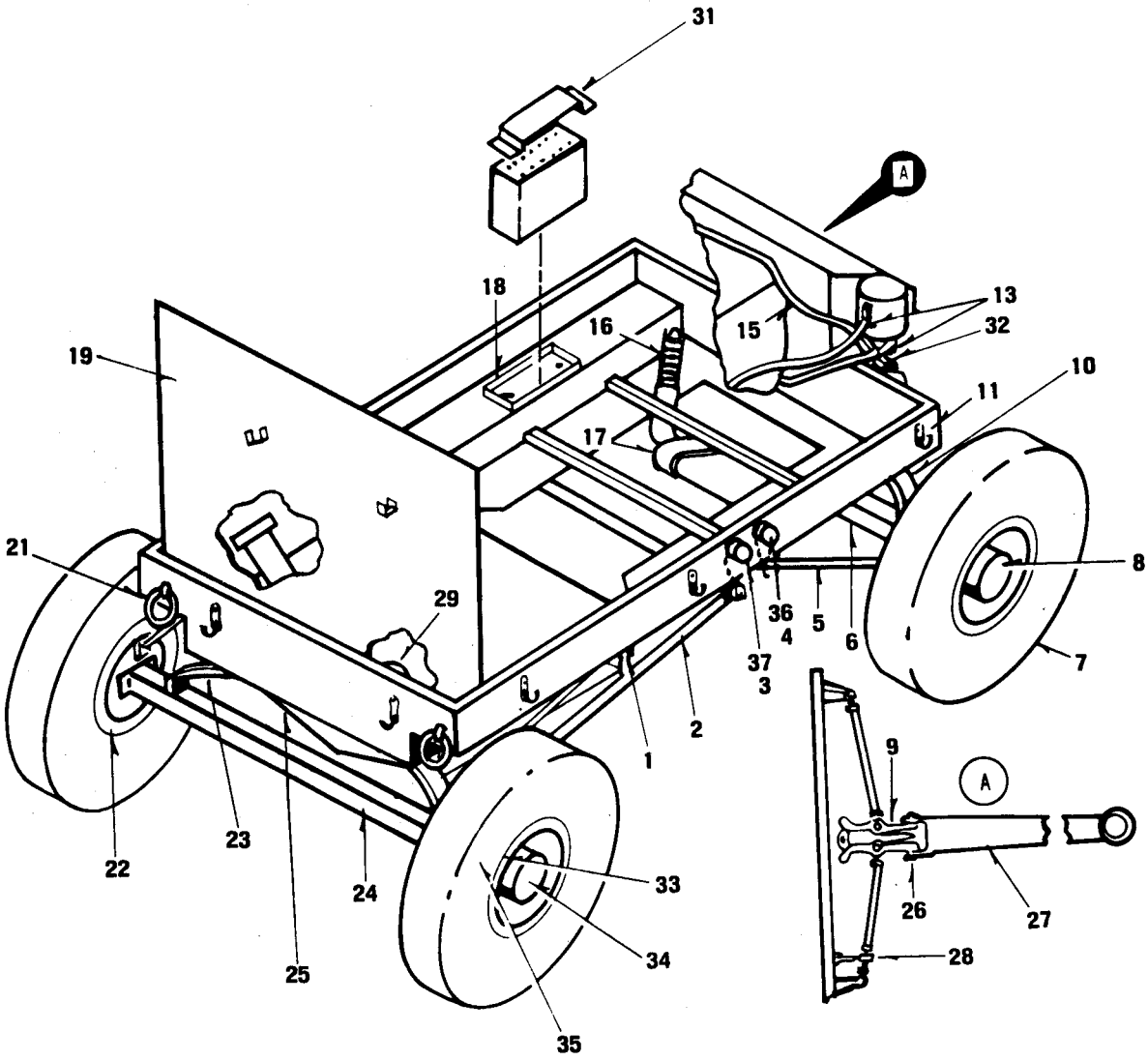


Figure C-9. Lower Chassis Assembly

(1) ILLUSTRATION (a) FIG NO	(b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	(7) UOI	(8) QTY INC IN UNIT
						GROUP 04 WHEEL ASSY		
C-9	1	XDFCD		53155	74-100-6	LOWERCHASISASSY	A	1
C-9	2	XDFZZ		22938	8300-400M	.BRAKERODASSEMBLY	A	1
C-9	3	PBDZZ	4730-00-591-0659	00624	155511-12D	.COUPLINGHALF,SELF-	A	1
C-9	4	PBDZZ	4730-00-591-0666	00624	155511-8D	.COUPLINGHALF,QUICK	A	1
C-9	5	XDFZZ		22938	245-5911	.CROSSSHAFTASSY	A	1
C-9	6	XDFZZ		22938	245-1936	.FRONTAXLEASSY	A	1
C-9	7	PBFZZ	2610-00-050-5984	81349	ZZT41C	.TIRE,PNEUMATIC	A	4
C-9	7	PBFZZ	2610-00-585-1177	73P08	TR135	.INNERTUBE,PNEUMATI	A	4
C-9	8	XDFZZ	2530-00-440-0059	22938	3712	.WHEELASSEMBLY	A	4
C-9	9	XDFZZ		22938	1-3851	.CENTERARMASSY	A	1
C-9	10	XDFZZ		22938	4020-1	.FRONTSPRINGASSY	A	1
C-9	11	PBDZZ	5340-00-444-6466	06004	ZLA1008-13	.CLAMP,HOOK	A	11
C-9	13	XDFZZ		53155	74-401-10	.TUBEASSEMBLY	A	1
C-9	15	XDFZZ		53155	74-401-22	.TUBEASSEMBLY	A	1
C-9	16	XDFZZ		16764	40004	.EXHAUST TUBE	A	1
C-9	17	PBFZZ	2990-00-993-0446	66289	WD50A	.MUFFLER,EXHAUST	A	1
C-9	18	XDFZZ		53155	74-100-602-	.LOWER BRKT BATTERY	A	1
C-9	19	XDFZZ		53155	74-100-31	.BULKHEADASSY	A	1
C-9	21	XDFZZ	1670-00-294-2959	96756	4687756	.TIEDOWNRING	A	4
	22	XDFCD		22938	1-8206	.BRAKEDRUMASSY	A	2
	23	XDFZZ		22938	4020-1	.REARSPRINGASSY	A	1
	24	XDFCD		22938	245-1346	.REARAXLEASSY	A	1
	25	XDFCD		53155	74-100-11	.FUEL TANK SEEFIG.C-10FORBREAKDOWN	A	1
C-9	26	XDFZZ		22938	5400-1	.CENTERPIN	A	1
C-9	27	XDFZZ		22938	1-3502	.DRAWBAR	A	1
C-9	28	XDFZZ		22938	1-5904	.BRAKEHANDLEASSY	A	1
C-9	29	PBFFF	5680-00-435-4222	57733	385-B	.TRANSMITTER,LIQUID	A	1
C-9	31	XDFZZ		53155	74-100-602-3	.BRKTBATTERYHOLDER	A	1
C-9	32	PBDZZ	3030-00-526-4751	24161	2430	.BELT,V	A	1
C-9	33	XDFZZ		60038	2478-1	.INNERBEARING	A	4
C-9	34	XDFZZ		22938	15123	.OUTERBEARING	A	4
C-9	35	PBFZZ	5330-00-213-6952	22938	6311	.GREASESEAL	A	4
C-9	36	PBFZZ	5340-00-543-3960	00624	155S7-8D	.CAP,PROTECTIVE,DUST	A	1
C-9	37	PBFZZ	4730-00-561-1154	00624	155S7-12D	.CAP,QUICKDISCONNEC	A	1

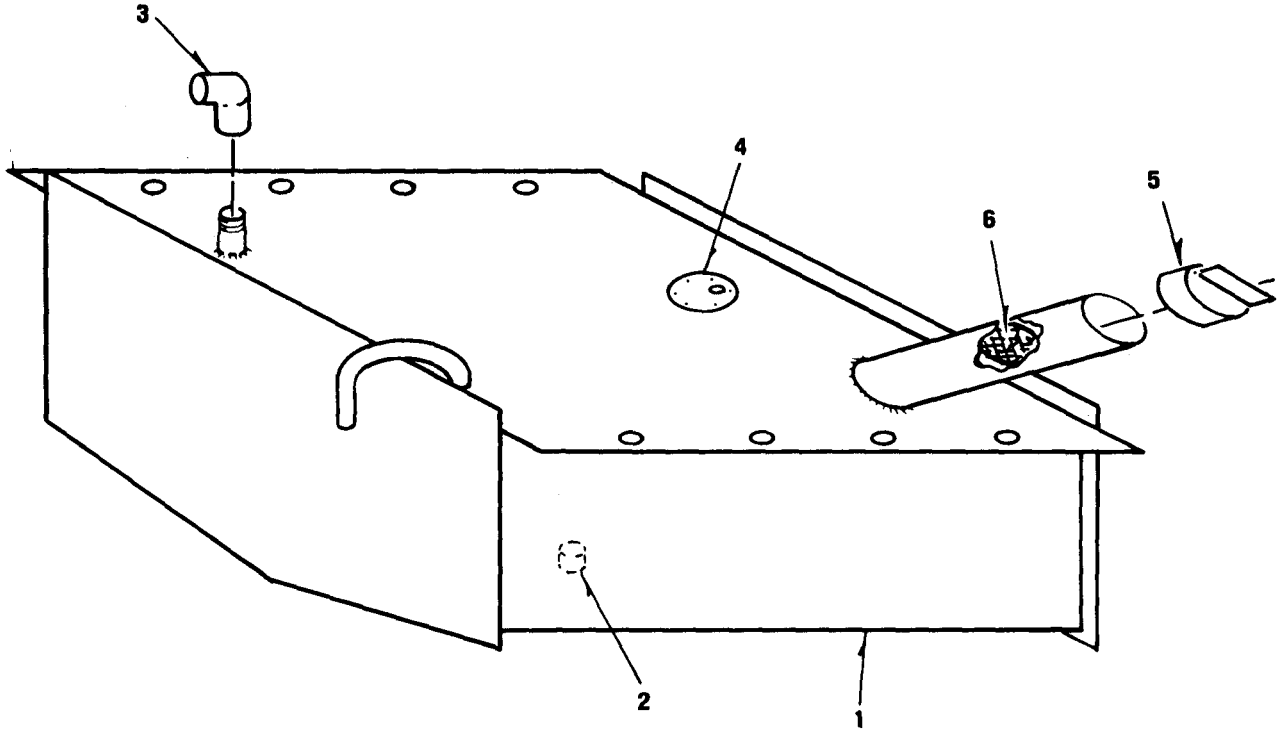


Figure C-10. Tank, Fuel Gasoline

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION USABLE ON CODE	(7) I/I	(8) QTY INC IN UNIT
C-10	1	PDFFF		5315	74-100-11	TANK,FUEL SEEFIG.C-9FORNHA	A	1
C-10	2	PBFZZ	4730-00-221-213	5650	MS20913-4S	.PLUG,PIPE	A	1
C-10	3	PDFZZ		3032	50F	.ELBOW	A	1
C-10	4	PDOFF	6680-00-435-422	5773	385-8	.SENDER,FUEL	A	1
C-10	5	PDFZZ		5315	74-100-11-1	.CAP,FUELTANK	A	1
C-10	6	PDFZZ		5315	74-100-11-2	.STRAINER	A	1

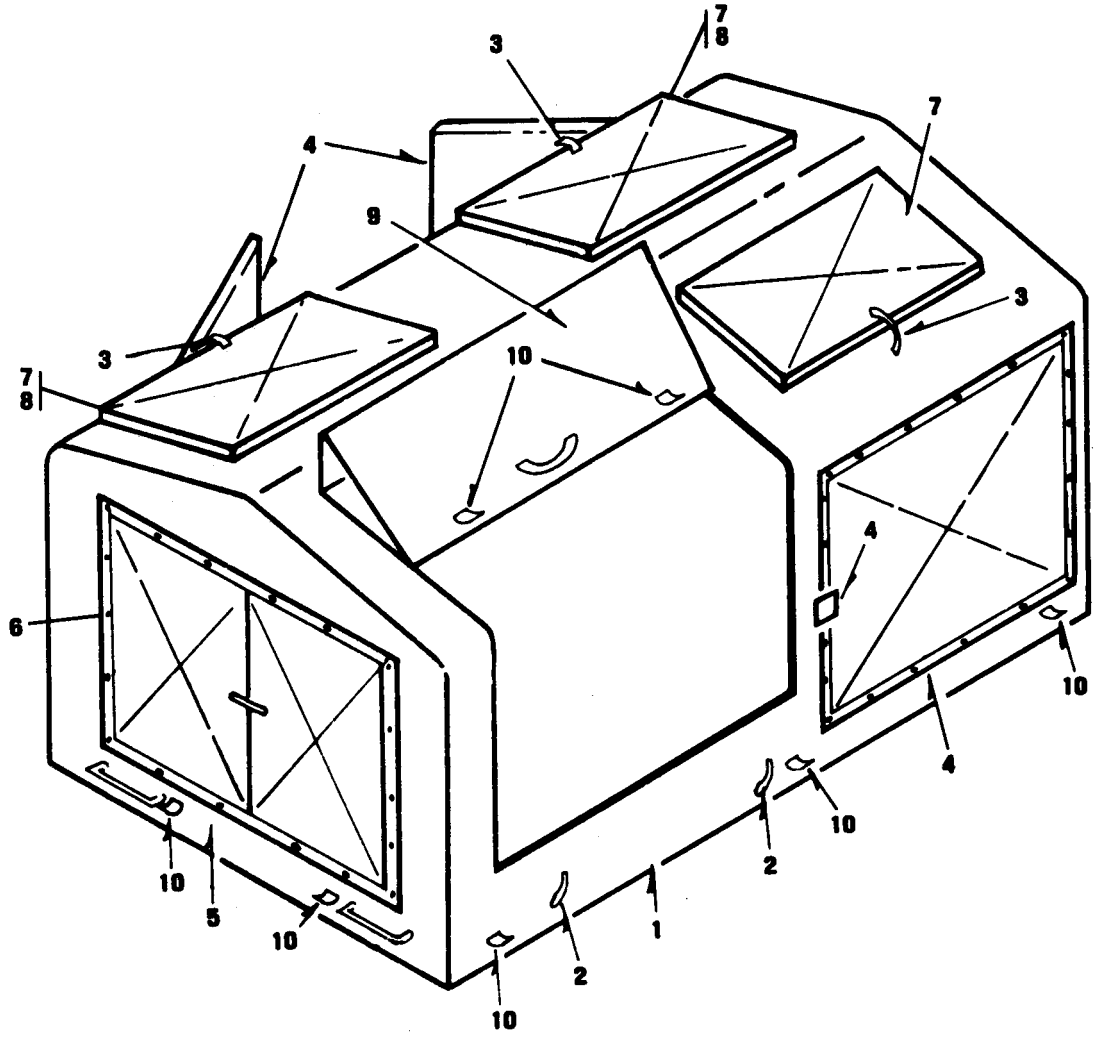


Figure C-11. Housing and Door Assembly

(1) ILLUSTRATION (a) FIG NO	(1) ILLUSTRATION (b) ITEM NO	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) FSCM	(5) PART NUMBER	(6) DESCRIPTION / USABLE ON CODE	(7) I/N	(8) QTY INC IN UNIT
						GROUP 05 CABINET ASSY		
C-11		DOFF		8315	74-100-8	HOUSING,DOORASSY	A	1
C-11		DOZZ		19200	MS11-2L-1042-12	.STRIKE	A	10
C-11		DOZZ		19200	2LA-1202-13	.LATCH,DOOR	A	5
C-11		DOFF		8315	74-100-8-1	.FRAME&DOORASSY	A	3
C-11		DOFF		8315	74-100-8-2	.FRAME&DOORASSY	A	1
C-11		DFFF		8315	74-100-2	.. RH DOOR	A	1
C-11		DOFF		8315	74-100-8-3	.DOORASSY,TOP,ACCES	A	3
C-11		DFFZ		8315	74-100-1	..DOOR,ACCESS HYDRAULIC RESERVOIR	A	1
C-11		DOFF		8315	74-100-8-4	.DOORASSY,INSTR	A	1
C-11	1	DOZZ		19200	2LA-1208-13	.FASTENER	A	10

CNAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIGURE NO.	ITEM NO.
2610-00-050-9840	C-9	7
6140-00-059-3528	C-1	2
2940-00-141-9025	C-9	38
5310-00-159-6209	C-6	12
4730-00-186-9831	C-7	6
4730-00-187-0487	C-7	2
4730-00-194-0210	C-3	42
4730-00-194-0213	C-6	20
4730-00-194-0225	C-3	32
4730-00-194-0225	C-3	35
4730-00-194-0225	C-3	36
4730-00-196-1468	C-6	21
5330-00-213-8921	C-9	35
4730-00-221-2137	C-6	8
4730-00-221-2139	C-10	2
4730-00-231-5650	C-6	4
6680-00-247-3273	C-2	11
6680-00-247-3273	C-2	17
6170-00-294-2954	C-9	21
6680-00-435-4229	C-10	4
5680-00-435-4228	C-4	7
5680-00-435-4228	C-9	29
2530-00-440-0095	C-9	8
5340-00-444-6468	C-9	11
3030-00-528-4753	C-9	32
2805-00-536-8835	C-2	24
5340-00-543-3934	C-9	36
4730-00-561-1544	C-9	37
4730-00-591-0659	C-9	3
4730-00-591-0660	C-9	4
2805-00-624-9941	C-2	23
2805-00-695-1029	C-3	23
5210-00-803-9882	C-2	51
4330-00-804-1541	C-6	17
5305-00-914-3784	C-6	13
2990-00-993-0447	C-9	17

FSCM	PART NUMBER	FIGURE NO.	ITEM NO.
88044	AN26-13	C-3	11
45681	AN6227-88	C-3	44
14798	AN815-8	C-7	2
88044	AN912-10D	C-6	20
88044	AN912-13D	C-3	32
88044	AN912-13D	C-3	35
88044	AN912-13D	C-3	36
88044	AN912-7D	C-3	42
06541	A1SABC	C-6	6
86768	BF-4	C-4	8
91510	BJ1000-AST	4-18	7
66289	BS-11	C-2	12
57733	D-357-X	C-2	19
06004	HS11-ZL-1042-12	C-11	2
96906	MS122032	C-6	12
96906	MS18154-6	C-6	13
96906	MS20913-2S	C-6	8
96906	MS20913-4S	C-10	2
14798	MS27363H1200	C-7	1
96906	MS28741-12-12C0	C-7	5
96906	MS35210-71	C-4	9
96906	MS39232-7	C-6	4
96906	MS51953-97	C-6	21
96906	MS524392D12	C-7	6
96906	MS75047-1	C-1	2
28050	MVC-40SPEC389345	C-8	1
81321	P-142-16-0	C-5	35
98660	PE3110-12	C-6	22
24207	PMFFG-2001	C-2	43
24207	PMFFG-2001	C-3	19
24207	PMFFG-2004	C-2	27
24207	PMFFG-2004	C-2	40
24207	PMFFG-2004	C-3	15
24207	PMFFG-2004	C-3	37
16954	PV-36J-002-52R-CNM-000	C-5	38
70040	P115	C-9	38
86768	R-6701-4	C-2	36
86768	R6701-4 3/4 S2-1/4P	C-3	40
16754	S6-AC	C-8	2
16764	TH-89	C-2	14
73808	TR135	C-9	7
72100	V-5	C-2	4
72100	V-5	C-6	25
66289	VES27W	C-2	24
66289	VE693-1	C-2	23
66289	WD50A	C-9	17
06004	ZLA-1008-13	C-11	10
06004	ZLA-1202-13	C-11	3
06004	ZLA1008-13	C-9	11
81349	ZZT410	C-9	7
16954	035-12555	C-3	8
16954	035-16956	C-3	7
22938	1-3592	C-9	27
22938	1-3851	C-9	9
22938	1-5904	C-9	28
22938	1-8209	C-9	22
30327	108-HD	C-2	46
30327	108HD1-8	C-3	23
16764	1102379	C-1	1
53155	1201-PS-1	C-5	28
22938	1F123	C-9	34
00624	155-S5-12D	C-7	7
00624	155-S5-8D	C-7	3
00624	155-S9-12D	C-7	8
00624	155-S9-8D	C-7	4
00624	155S11-12D	C-9	3
00624	155S11-8D	C-9	4
00624	155S7-12D	C-9	37
00624	155S7-8D	C-9	36
72100	176F-33	C-2	3
72100	177C-33	C-2	10
45681	2-366	C-6	14
30327	24SB0BX04	C-3	24
30327	24SC0BX04	C-3	25
24161	2430	C-9	32
22938	245-1346	C-9	24
22938	245-1930	C-9	6
22938	245-591	C-9	5
60038	2478-1	C-9	33
75915	34GC5	C-2	53
81321	3C316-2	C-6	17
53155	313	C-2	52
22938	3712	C-9	8
57733	365-8	C-10	4
57733	365-8	C-4	7
57733	365-8	C-9	29
16764	40004	C-9	16
22938	4020-1	C-9	10
22938	4020-1	C-9	23
53155	453-1/2S2-6	C-5	27
98750	4887796	C-9	21
30327	5CF	C-10	3
22938	5400-1	C-9	26
91916	5508-6MP-10	C-6	23
22031	5602	C-5	32
57733	616-8	C-2	11
57733	616-8	C-2	17
22938	6211	C-9	35
20954	668-2003	C-3	4
81321	6681089	C-5	37
86768	694-1/4B	C-5	33
20954	717-0614	C-2	21
30327	721FS01	C-5	48
53155	74-100-1	C-11	8
53155	74-100-11	C-10	1
53155	74-100-11	C-9	25
53155	74-100-11-1	C-10	5
53155	74-100-11-2	C-10	6
53155	74-100-13	C-4	1
53155	74-100-13-1	C-4	4
53155	74-100-13-2	C-4	10
53155	74-100-177	C-2	34
53155	74-100-177-1	C-3	5
53155	74-100-177-2	C-3	6

NATIONAL STOCK NUMBER AND PART NUMBER INDEX

FSCM	PART NUMBER	FIGURE NO.	ITEM NO.
53155	74-100-2	C-11	6
53155	74-100-200	C-5	25
53155	74-100-200	C-6	
53155	74-100-200-1	C-6	1
53155	74-100-200-15	C-6	15
53155	74-100-200-16	C-6	16
53155	74-100-200-2	C-6	2
53155	74-100-200-9	C-6	9
53155	74-100-201-1	C-3	9
53155	74-100-201-3	C-3	43
53155	74-100-202	C-2	41
53155	74-100-202-1	C-3	12
53155	74-100-202-3	C-3	13
53155	74-100-204-3	C-3	10
53155	74-100-31	C-9	19
53155	74-100-51	C-2	
53155	74-100-51A	C-3	2
53155	74-100-51B	C-3	1
53155	74-100-54	C-5	42
53155	74-100-6	C-9	1
53155	74-100-602-1	C-9	18
53155	74-100-602-3	C-9	31
53155	74-100-69	C-3	3
53155	74-100-8	C-11	1
53155	74-100-8-1	C-11	4
53155	74-100-8-2	C-11	5
53155	74-100-8-3	C-11	7
53155	74-100-8-4	C-11	9
53155	74-100-9	C-5	26
53155	74-400-10	C-5	4
53155	74-400-21	C-5	1
53155	74-400-22	C-5	8
53155	74-400-3	C-5	6
53155	74-400-36	C-5	7
53155	74-400-4	C-5	2
53155	74-401-10	C-9	13
53155	74-401-12	C-5	13
53155	74-401-13	C-5	9
53155	74-401-14	C-5	16
53155	74-401-17	C-5	11
53155	74-401-22	C-9	15
53155	74-401-26	C-5	14
53155	74-401-36	C-5	15
53155	74-401-5	C-5	12
53155	74-401-7	C-5	24
53155	74-401-8	C-5	10
53155	74-401-9	C-5	20
53155	74-402-14	C-5	3
53155	74-402-16	C-5	44
53155	74-402-2	C-5	21
53155	74-402-20	C-5	18
53155	74-402-21	C-5	19
53155	74-402-22	C-5	5
53155	74-402-3 3/4	C-5	23
53155	74-403-14	C-5	22
53155	74-403-34	C-7	
53155	74TS100-10-1	C-7	
53155	74TS100-10-3	C-2	1
53155	7400-1	C-2	15
53155	7400-10	C-2	16
53155	7400-11	C-2	18
53155	7400-12	C-2	25
53155	7400-13	C-2	28
53155	7400-14	C-2	45
53155	7400-15	C-2	47
53155	7400-16	C-2	44
53155	7400-17	C-2	42
53155	7400-18	C-2	37
53155	7400-19	C-2	2
53155	7400-2	C-2	38
53155	7400-20	C-2	49
53155	7400-21	C-2	29
53155	7400-22	C-2	30
53155	7400-23	C-2	32
53155	7400-24	C-2	33
53155	7400-25	C-2	39
53155	7400-26	C-2	35
53155	7400-27	C-2	48
53155	7400-3	C-2	5
53155	7400-4	C-2	26
53155	7400-5	C-2	13
53155	7400-6	C-2	8
53155	7400-7	C-2	9
53155	7400-9	C-2	31
86768	744-2002	C-3	31
53155	75-100-201	C-2	50
86768	751-123	C-4	6
97676	AMPE	C-5	17
72619	B06-1710-0431-50	C-2	6
72619	B06-1710-0431-504	C-2	51
22938	B300-40DM	C-9	2
30327	B32-ES-04	C-2	7
30327	B32ES04	C-5	30
30327	B41ES04	C-3	26
30327	B44ES08	C-5	45
20954	B45-2096	C-2	20
30327	B45ES02X02	C-5	36
30327	B45ES12	C-5	46
30327	B45ES12X12	C-6	24
30327	B48ES04X02	C-3	20
30327	B48ES04X04	C-5	31
30327	B48ES04X04	C-5	34
30327	B48ES12X08	C-4	3
30327	B48ES12X08	C-5	40
30327	B48ES12X12	C-3	45
30327	B49ES012X12	C-5	47
30327	B49ES02X02	C-6	19
30327	B49ES04X02	C-3	17
30327	B49ES04X02	C-3	19
30327	B49ES04X02	C-3	21
30327	B49ES04X02	C-3	22
30327	B49ES08X08	C-3	14
30327	B49ES08X08	C-3	16
30327	B49ES08X08	C-3	27
30327	B49ES08X08	C-3	28
30327	B49ES08X08	C-3	38
30327	B49ES08X08	C-3	39
30327	B49ES08X12	C-3	41
30327	B49ES12X12	C-4	5
30327	B49ES12X12	C-6	18
30327	B49ES16X16	C-3	29
30327	B49ES16X16	C-4	2
30327	B49ES16X16	C-6	10
30327	B51ES02X02	C-5	29
30327	B54ES12X12	C-3	33
30327	B54ES12X12	C-3	34
30327	B63ES012X12	C-5	43
20954	B33-6223	C-2	22

*U.S. GOVERNMENT PRINTING OFF ICE: 1981--765-035/279

APPENDIX D

OPERATION AND MAINTENANCE INSTRUCTIONS

BOOK OF INSTRUCTIONS

WISCONSIN *Air-Cooled*

FOUR CYLINDER ENGINE

MILITARY VERSION

LIFT OPEN ENGINE
By inserting hook under exhaust manifold web.

LIFT POWER UNIT
By removing exhaust flanges and threadiwg lift hook coupling on to exhaust pipe.

NOTE: These models of engines include Military standardized parts and are built to conform with Military Specifications MIL-E-11275-D, MIL-E-11275-C, MIL-E-11275-B or MIL-E-11275-A.

The only difference between MIL-E-11275-D and MIL-E-11275-C built enqines is; the omission of the fuel tank, fuel filter and their mounting components in the MIL-E-11275-D specification.

The basic differences between the MIL-E-11275-C and MIL-E-11275-B built engines, is the modification of the ignition system to accommodate Military standard spark plugs and ignition wires, as well as a Military standard air cleaner.

MIL-E-11275-A engines differ considerably from those built to MIL-E-11275-C and MIL-E-11275-B specifications, with the principal physical difference being the height of the engine from the bottom of the mounting feet to the centerline of the crankshaft. This dimension is 9" for MIL-E-11275-A spec engines and 9-1/8' for MIL-E-11275-C and MIL-E-11275-B engines. Refer to Sectional Drawing Fig. 3.

3-7/16" Bore - 4" Stroke
148.5 cu. in. Displacement

Model MVG4D

ISSUE MM-288-B

INTRODUCTION

This manual has been compiled to suit the service requirements of the basic engines and accessories most commonly supplied with engines.

Wisconsin Motor Corporation adapts its engines to suit individual customer requirements whenever practical. However, it would become too involved to include all variations in one manual; therefore, should any problems arise concerning engine servicing, we advise that a Wisconsin distributor or authorized service station be contacted, as they are capable of identifying all parts by the specification number stamped on the name plate of engine.

A listing of approved Wisconsin service stations appears in the back of this manual.

WISCONSIN heavy duty air cooled engines are of the most advanced design and are built in a modern factory, equipped with the latest machinery available. Only the best materials, most suitable for the particular part, are used. During production, every part is subjected to the most rigid inspection, as are also the completely assembled engines, After assembly, every engine is operated on its own power for several hours. All adjustments are carefully made so that each engine will be in perfect operating condition when it leaves the factory.

Back of the Wisconsin Motor Corporation are more than fifty years of engineering experience in the design of gasoline engines for every conceivable type of service. The performance of these engines is proof of the long satisfactory service you too can expect from your engine.

Like all fine machinery, the engine must be given regular care and be operated in accordance with the instructions.

SAFETY PRECAUTIONS

Precaution is the best insurance against an accident.

Never fill fuel tank while engine is in operation or hot, to avoid the possibility of spilled fuel causing a fire.

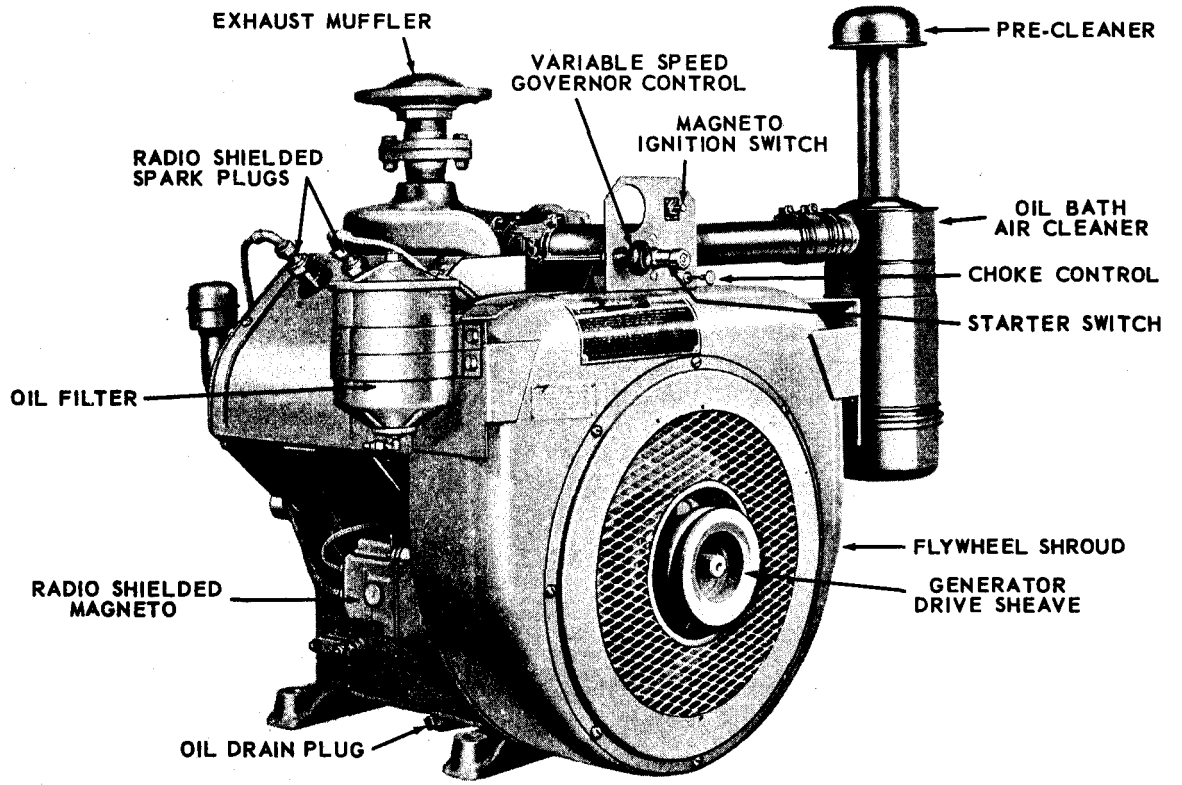
Never operate engine in a closed building unless the exhaust is piped outside. This exhaust contains carbon monoxide, a poisonous, odorless and invisible gas, which if breathed causes serious illness and possible death.

Never make adjustments on machinery while it is connected to the engine, without first removing the ignition cable from the spark plug. Turning over the machinery by hand during adjusting or cleaning might start the engine and machinery with it, causing serious injury to the operator.

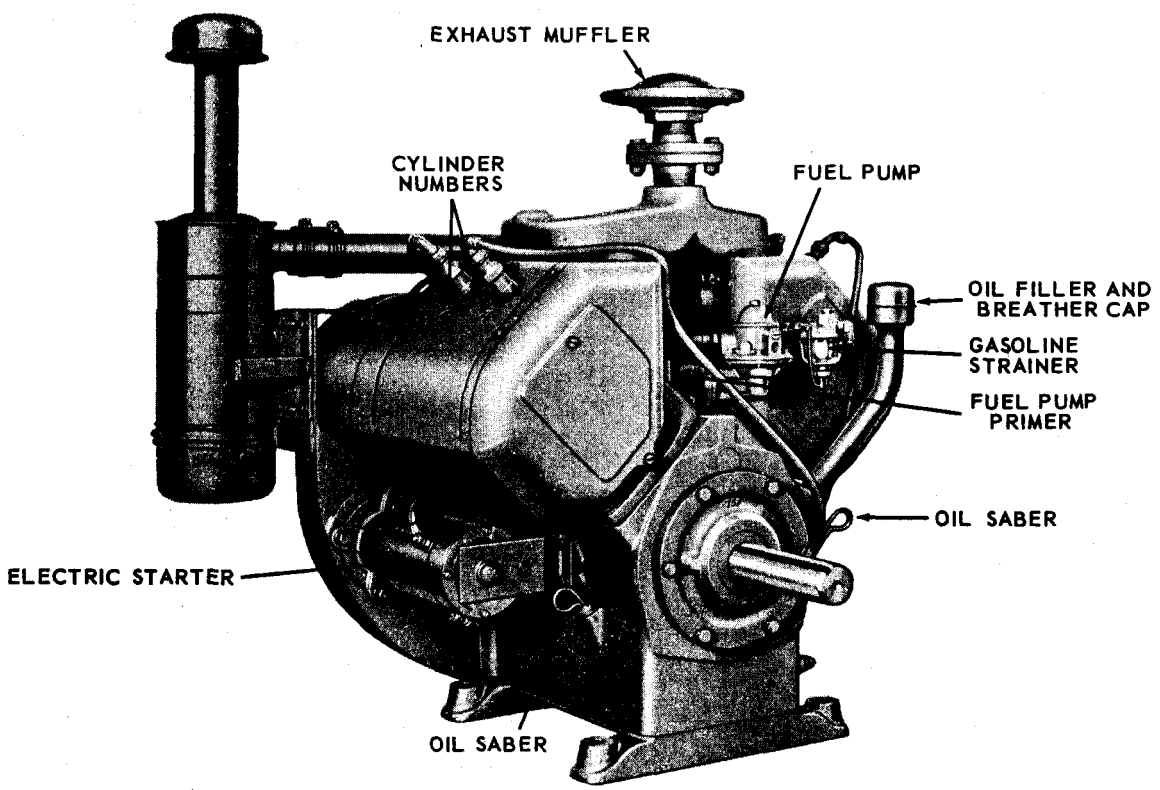
Keep this book handy at all times, familiarize yourself with the operating instructions.

W I S C O N S I N M O T O R C O R P O R A T I O N
MILWAUKEE, WISCONSIN 53246

INDEX



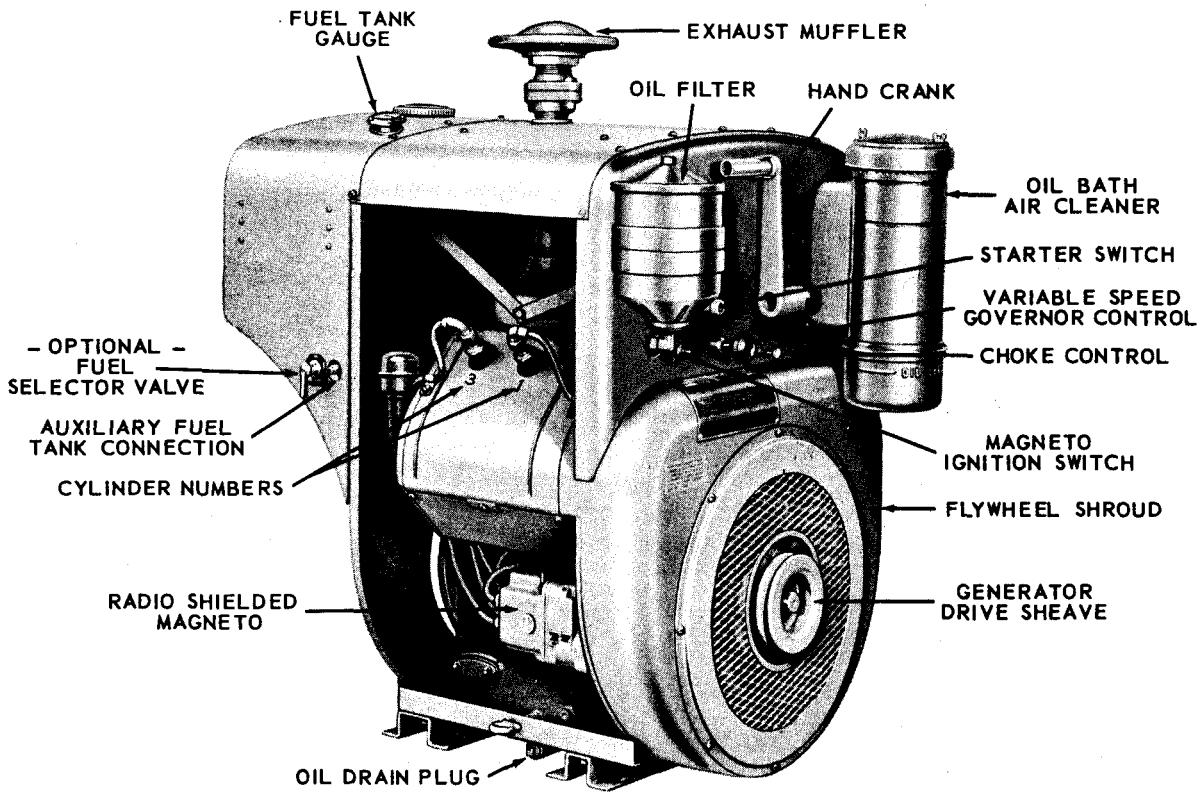
FRONT (Fan End) AND LEFT HAND SIDE VIEW OF OPEN ENGINE



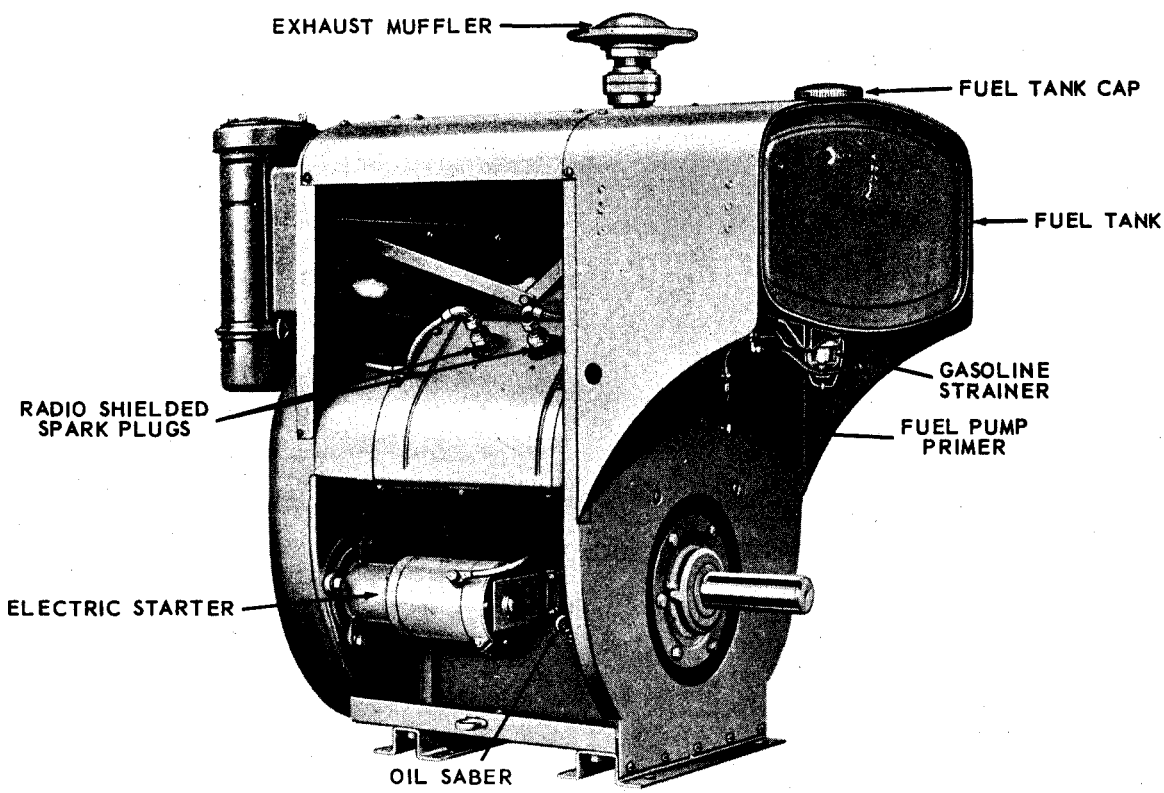
REAR (Take-Off) AND RIGHT HAND SIDE VIEW OF OPEN ENGINE

208061C-A
208063C-A

Fig. 1
MODEL MVG4D OPEN ENGINE



FRONT (Fan End) AND LEFT HAND SIDE VIEW OF POWER UNIT



REAR (Take-Off) AND RIGHT HAND SIDE VIEW OF POWER UNIT

203071C-A
203072C-A

Fig. 2
MODEL MVG4D POWER UNIT

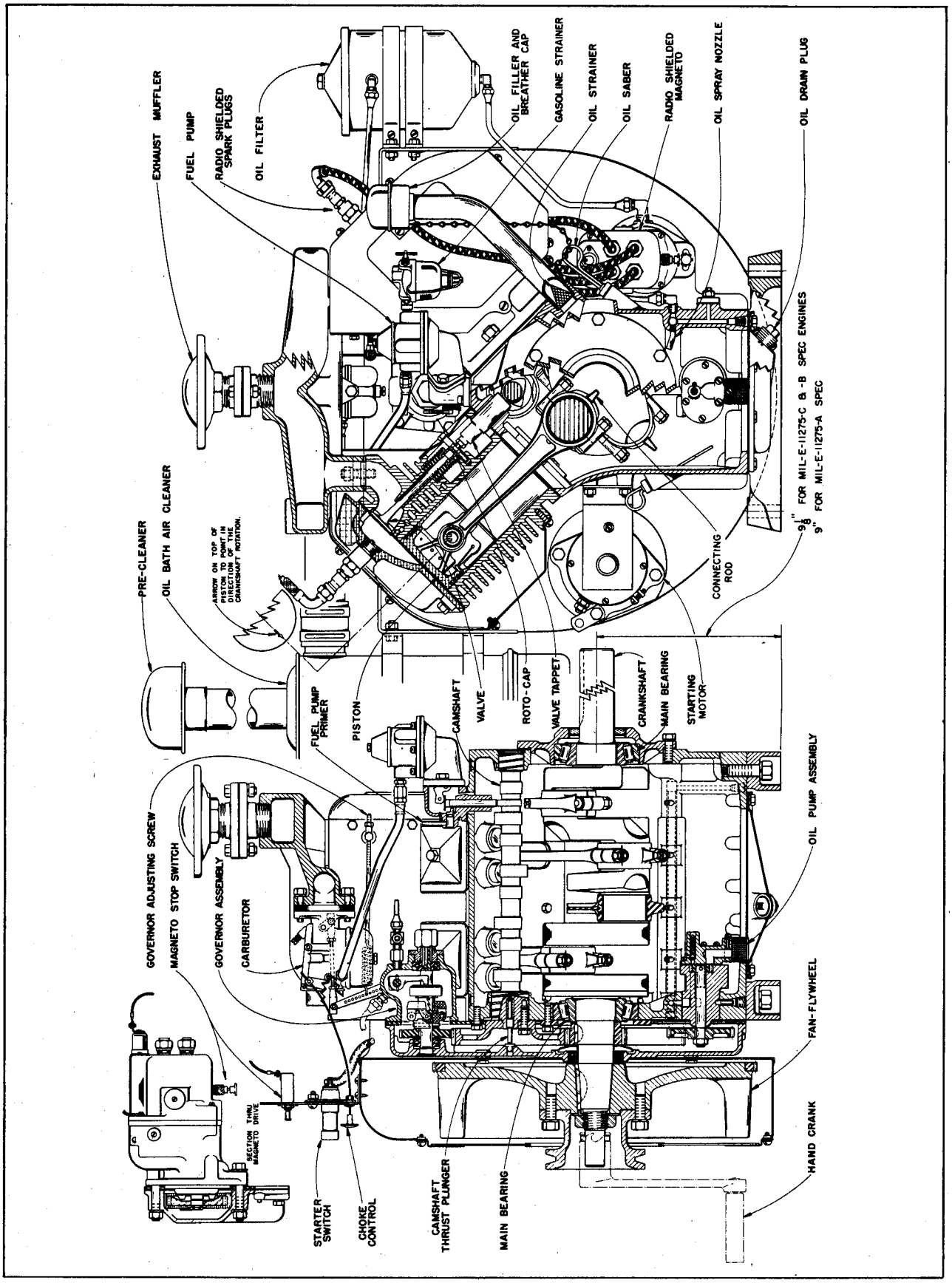


Fig. 3
CROSS SECTION OF MODEL MVG4D ENGINE

GENERAL INFORMATION AND DESIGN

Wisconsin engines are of the **four cycle** type, in which each of the four operations of **suction, compression, expansion** and exhaust requires a complete stroke. This gives one power stroke per cylinder for each two revolutions of the crankshaft.

COOLING

Cooling is accomplished by a flow of air, circulated over the cylinders and heads of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts.

Never operate an engine with any part of the shrouding removed, because this will retard the air cooling.

CARBURETOR

The proper combustible mixture of gasoline and air is furnished by a balanced carburetor, giving correct fuel to air ratios for all speeds and loads.

IGNITION

The spark for ignition of the fuel mixture is furnished by a high tension ***radio shielded*** magneto driven off the timing gears at crankshaft speed. The magneto distributor rotor ***turns at half-engine speed.*** The magneto is fitted with an impulse coupling, which makes possible a powerful spark for easy starting. Also, the impulse coupling automatically retards the timing of the spark for starting, thus eliminating danger of a kick-back from the engine when cranking.

LUBRICATION SYSTEM

A gear type pump supplies oil to four nozzles which direct oil streams against fins on the connecting rod caps. Part of the oil enters the rod bearing through holes in the rods, and the balance of the oil forms a spray or mist which lubricates the cylinders and all other internal parts of the engine. An external oil line from the oil header tube in the crankcase lubricates the governor and gear train, see Fig. 4.

GOVERNOR

A governor of the centrifugal flyball type controls the engine speed by varying the throttle opening to suit the load imposed upon the engine. All engines are equipped with either ***fixed speed*** governors, a ***variable speed regulator*** **to** control the governed speed of the engine, or ***an idle control.***

ROTATION

The rotation of the crankshaft is clockwise when viewing the flywheel or cranking end of the engine. This gives ***counter-clockwise rotation*** when viewing the power take-off end of the crankshaft. The flywheel end of the engine is designated the ***front end,*** and the power take-off end, the ***rear end*** of the engine.

HORSEPOWER

R.P.M.	HORSEPOWER
1400	24.5
1600	27.6
1800	30.2
2000	32.4
2200	34.5
2400	36.0

The horsepower given in the chart is for an atmospheric temperature of 60° Fahrenheit, at sea level, and at a Barometric pressure of 29.92 inches of mercury.

For each inch lower Barometer reading deduct 3½% from above horsepower.

For each 10° higher temperature there will be a reduction in horsepower of 1%.

For each 1000 ft. altitude above sea level there will be a reduction in horsepower of 3½%.

The friction in new engines cannot be reduced to the ultimate minimum during the regular block test, but engines are guaranteed to develop at least 85 per cent of maximum power when shipped from the factory. The power will increase, as friction is reduced, during a few days of operation. The engine will develop at least 95% of power shown on chart when friction is reduced to a minimum.

For continuous operation allow 25% of horsepower shown, as a safety **factor.**

INSTRUCTIONS FOR STARTING AND OPERATING

Some of these engines are covered with a sheet metal house, as shown in ***Fig. 2,*** and are called ***power units.*** Others are furnished without a house, as shown in *Fig. 1,* and are called ***open engines.***

On engines with a house, the side doors must always be removed when operating, so that cooling air will circulate properly.

LUBRICATION

Before starting a new engine, fill the oil base with the correct grade of lubricating oil, as specified in the "Grade of Oil" chart. Fill through the breather tube shown in *Fig, 5,* with 6 quarts of oil; 5 quarts for the crankcase and an additional 1 quart is required if engine has a ***Military type oil filter.***

After the engine has been ***run-in,*** as per instructions on inside of front cover, the oil lines and oil filter will have been filled with oil. Shut off the engine and check the oil level by means of the ***oil gauge saber,*** *as* shown in *Fig. 6.* If necessary, add enough oil to bring the level up to the ***fu// mark.*** An oil saber is located on the left hand side of the engine below the oil filler and breather tube, and if specified a saber can be furnished on the opposite side as shown in *Fig. 6.*

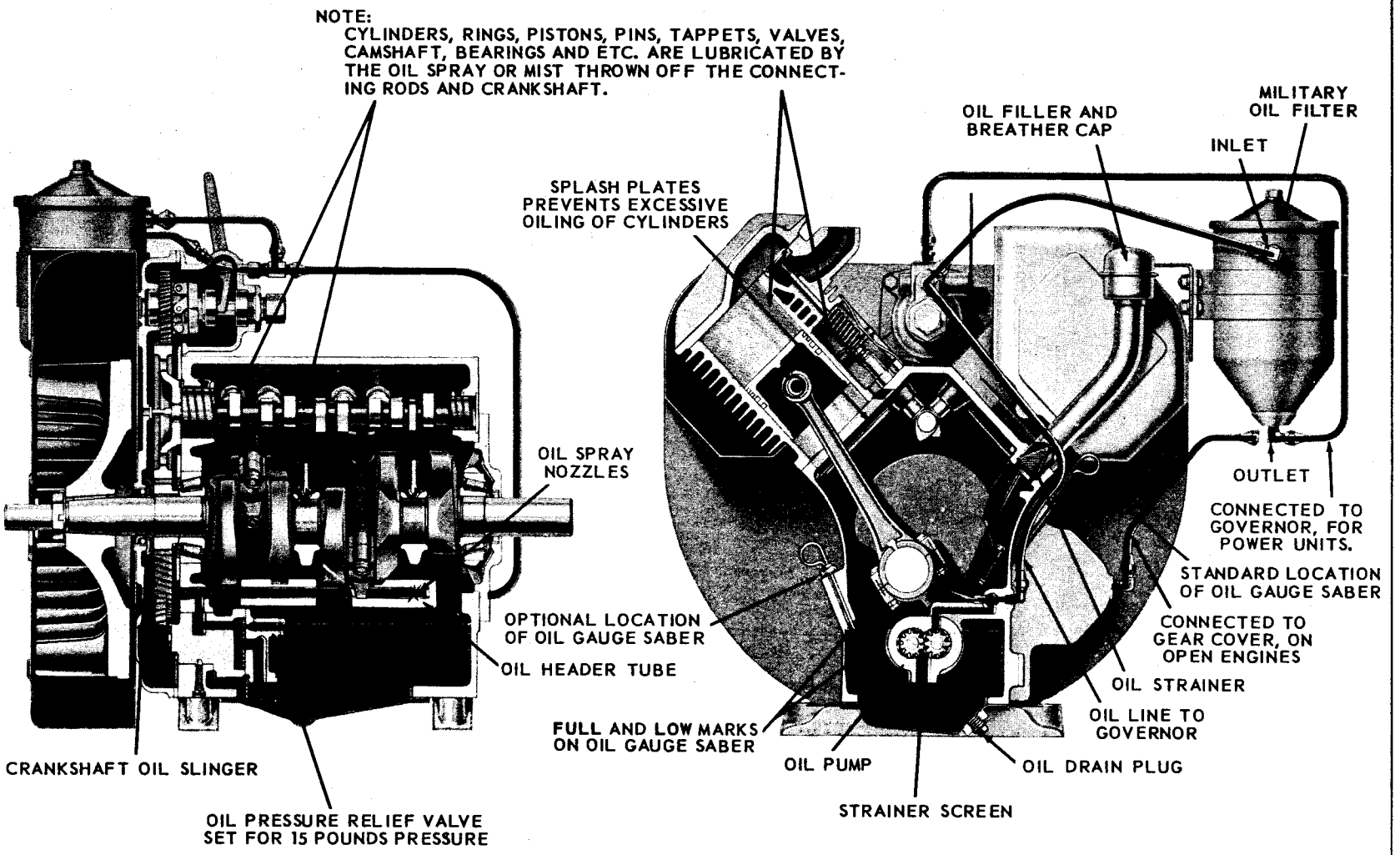


Fig. 4 LUBRICATION SYSTEM

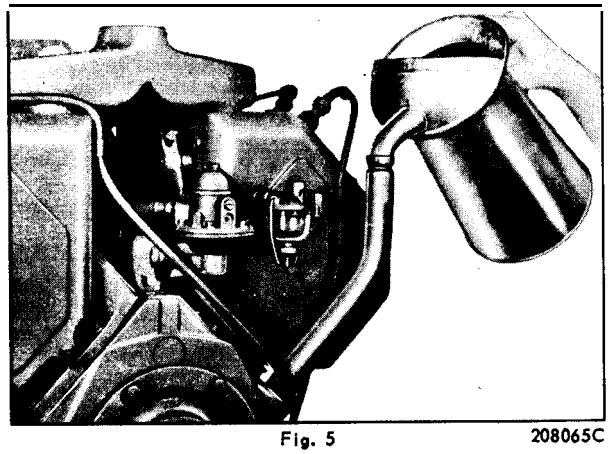


Fig. 5 208065C

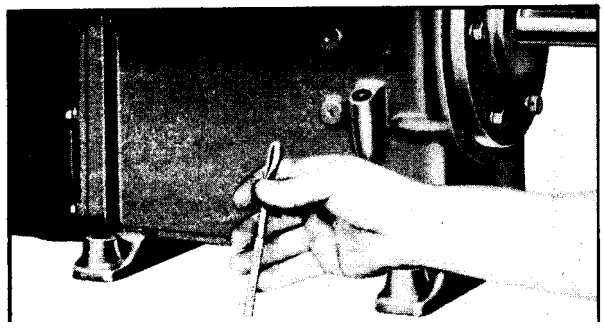


Fig. 6 76694C

GRADE OF OIL CHART

SEASON OR TEMPERATURE	GRADE OF OIL	MILITARY SPECIFICATION
Spring, Summer or Autumn + 120°F to + 40°F	SAE 30	MIL-L-2104
Winter + 40°F to − 10°F	SAE 10	MIL-L-2104
Winter − 10°F to − 65°F	Oil, Engine, Sub Zero	MIL-L-10295
Crankcase Capacity		5 Qts.
Oil Filter and Oil Lines		1 Qt.

GRADE OF OIL

Follow summer recommendations in winter if engine is housed in warm building.

Check oil level every 8 hours of operation.

The old oil should be drained and fresh oil added after every 50 hours of operation.

To drain oil, remove drain plug illustrated in *Fig. 4.* Oil should be drained while engine is hot, as it will then flow more freely.

OIL PRESSURE

At engine operating temperature the oil pressure will be about 4 to 5 pounds per square inch. Due to this low pressure system an oil pressure gauge is not required. When the engine *is* cold the pressure will be higher, and a relief valve is fitted to the oil pump so that under these conditions the maximum pressure will be limited to 15 pounds.

OIL FILTER

A ***Military oil filter,*** as illustrated in *Fig. 4,* is furnished on both the open engine and power unit, built to **MIL-E- 11275-C** and **MIL-E- 11275-B** specifications.

The oil filtering cartridge should be replaced after every 100 hours of operation, under normal operating conditions. If engine is operated under extreme dusty conditions, replace cartridge after every oil change.

Refer to accessory section in the rear of the manual for further service instruction and replacement parts.

A ***Wisconsin*** commercially used ***by-pass*** type oil filter is used on **MIL-E- 11275-A** spec engines. This filter is mounted on the left hand side of the crankcase, next to the magneto, as illustrated in parts list section, *Fig. 54.*

The filter cartridge should be replaced after every other oil change. If operating conditions are extremely dusty, replace cartridge after every oil change. Part number is located on top of cartridge, for replacement identification.

FUEL

These engines can be furnished "with a gravity feed tank mounted above the level of the carburetor, or with a side mount tank. In all cases a fuel pump is furnished on the engine.

The fuel tank should be filled with a good quality of gasoline free from dirt and water. Some of the poorer grades of gasoline contain gum which will deposit on valve stems, piston rings, and in various small passages in the carburetor and thus cause serious trouble in operating, and in fact might prevent the engine from operating at all.

***Use gasoline that conforms to Military Specifications* MIL-G-3056 *or* MIL-F-5572.**

FUEL PUMP

All engines are equipped with a fuel pump. When starting a new engine for the first time, or when engines

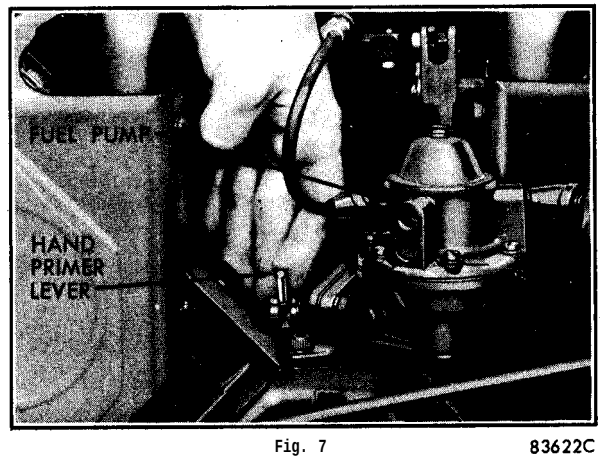


Fig. 7 83622C

have been out of operation for a while, the hand primer lever on the fuel pump adapter should be used to pump gasoline into the dry carburetor. When priming, a distinct resistance of the fuel pump diaphragm should be felt when moving the hand lever back and forth. If this is not the case, the engine should be turned over a revolution so that the fuel pump cam will be rotated from its upper position, which would prevent priming. The hand lever should be given about 20 to 30 strokes, depending on how much fuel, if any, there is in the carburetor float chamber, see *Fig. 7.* When the carburetor is full, the hand primer lever will move more easily.

GASOLINE STRAINER

The gasoline strainer is very necessary to prevent sediment, dirt and water from entering the carburetor and causing trouble or even complete stoppage of the engine. The strainer bowl should be inspected frequently, and cleaned if dirt or water are present. To remove bowl, first shut off fuel valve, then loosen the knurled nut below bowl and swing the wire bail to one side. After cleaning bowl and screen, reassemble the parts, being sure the gasket is in good condition; otherwise use a new gasket. *See Fig, 8,*

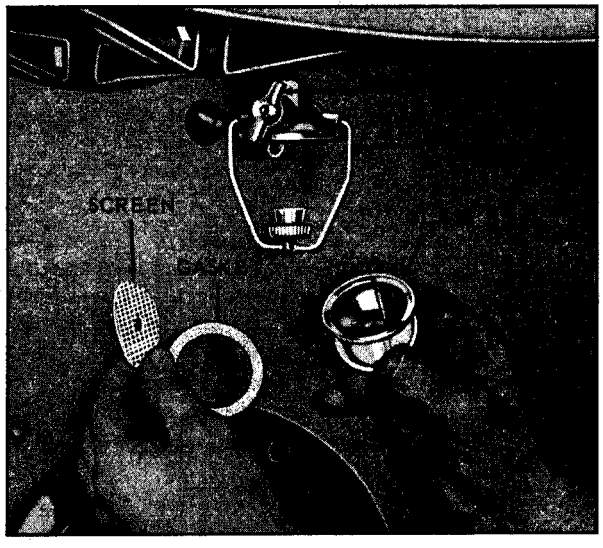


Fig. 8 71051C

which shows the gasoline strainer mounted to the fuel tank of a power unit. On open engines, the strainer is mounted to the inlet of the fuel pump.

IGNITION SWITCH

On **MIL-E-11275-C** spec engines, a ***positive action*** ground switch is located at the bottom of the magneto end cover. The switch button is ***pulled out*** when starting the engine and ***pushed in*** for stopping. Engines built to the **MIL-E-11275-B** and **MIL-E-11275-A** specifications have a spring type switch button which is always in the on or running position, and must be depressed and held down until engine stops.

On power units, the magneto ignition switch is on the outside of the house panel, at the flywheel end. *See bottom view of Fig. 1.* When starting or stopping engine, follow instructions on switch tag.

STARTING

STARTING PROCEDURE for -25°F. to +120°F.

1. Check crankcase oil level.
2. Open fuel valve after checking gasoline supply in tank.
3. Disengage clutch (if applicable).
4. New engines require priming; refer to "Fuel Pump" paragraph for instructions.
5. Set magneto switch in running position.
6. If engine is equipped with a variable speed control, set throttle about 1/2 open; fixed speed governors require no setting, and over center idle control should be in full load position.
7. Close carburetor choke by pulling choke button to extreme out position.
8. Turn engine over one or two revolutions. Push choke button in about half-way and then pull up briskly on the starting crank. ***Do not*** attempt to ***spin*** the engine with the starting crank. If the engine does not start on the first pull up of the crank, re-engage the crank and repeat the operation.
   With electric starting motor; depress starter button switch. The engine should start within 2 or 3 crankshaft revolutions. If starting difficulty is experienced, do not ***'grind away'*** at the starter, but rather attempt short intermittent starting cycles.
9. After engine starts, push in choke button as required for smooth running. Choke must be completely open when engine is warmed up.

If flooding should occur, open choke fully, by pushing choke button in and continue cranking. More cranking is necessary when starting in cold temperatures than in warm.

If the engine will not start, check to determine if fuel is being supplied to the engine. Also check ignition wire contacts at magneto and spark plugs. *See Starting Difficulties, Page 14.*

If the starter is ***'dead'*** or is unable to turn the engine ***over,*** check battery and cable connections at the battery, starting motor, and starting switch; also check for broken or frayed cables. Test starting switch and starting motor and replace or repair if necessary.

STARTING at -69°F. to -25°F.

1. Apply starting aids.
2. Follow instructions for starting at -25°F. to + 120°F.
3. Operate engine at 1800 R.P.M. without load for a minimum of 10 minutes.
4. Increase speed to rated R.P.M. of engine for an additional 5 minutes before applying load.

WARM-UP PERIOD

The engine should be allowed to warm up to operating temperature before the load is applied. This requires only a few minutes of running the engine at a moderate speed.

Racing an engine or gunning it, to hurry the warm-up period, ***is very destructive*** to the polished wearing surfaces on pistons, rings, cylinders, bearings, etc., as the proper oil film on these various surfaces cannot be established until the oil has warmed up and become sufficiently fluid. This is especially important on new engines and in cool weather.

Racing an engine by disconnecting the governor, or by doing anything to interfere with the governed control engine speed, is ***extremely dangerous.*** Quite naturally the operator of the engine desires to get all possible power out of an engine, and the engine manufacturer does his best to supply this want, but if all of this power is used merely to speed up the engine, without any load being imposed upon it, dangerously high speeds will result.

The governor is provided as a means for controlling the engine speed to suit the load applied, and also as a safety measure to guard against excessive speeds, which not only overstrain all working parts, but which might cause wrecking of the engine and possible injury to bystanders.

All parts of the engine are designed to safely withstand any speeds which might normally be required, but it must be remembered that the stresses set up in rotating parts increase with the square of the speed. That means that if the speed is doubled, the stresses will be quadrupled, and if the speeds are trebled, the stresses will be nine times as great.

Strict adherence to the above instructions cannot be too strongly urged, and greatly increased engine life will result as a reward for these easily applied recommendations.

STOPPING ENGINE

Depress magneto switch to stop engine. With spring button ground switch, hold stop button in depressed position until engine stops.

If the engine has been running hard and is hot, do not stop it abruptly from full load, but remove the load and allow engine to run idle at 1000 to 1200 R.P.M for three to five minutes, depending on how hot the engine has been. This will reduce the internal temperature of the engine much faster, minimize valve warping, and of course the external temperature, ineluding the manifold and carburetor will also reduce faster, due to air circulation from the flywheel.

Two main troubles resulting from abrupt shutting off a hot engine are ***vapor lock*** and ***dieseling.*** Vapor lock will prevent the flow of fuel in the fuel lines and carburetor passages, which will result in hard starting of the engine. This can be overcome by choking the engine when cranking or waiting until the engine has cooled off sufficiently to overcome the vapor lock. Dieseling, is caused by the carbon and lead deposits in the cylinder head being heated up to such an extent that they continue to fire the engine and keep it running after the ignition has been shutoff. By idling the engine, as previously mentioned, the carbon and lead deposits cool off, break up and will blow out thru the exhaust. If engine should continue to diesel, by suddenly opening up the throttle wide and at the same time shutting off the ignition, the engine will stop.

AIR CLEANER

The air cleaner is an essential accessory, filtering the air entering the carburetor, and thereby prolonging the life of the engine.

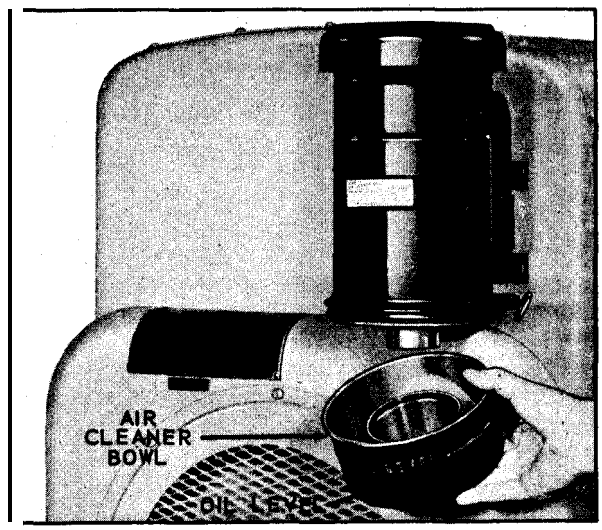


Fig. 9 **104577C**

Remove the bowl from the air cleaner, as illustrated in *Fig. 9.* Fill the bowl to oil level line with the same grade of oil as used in the crankcase. Detailed instructions are printed on the air cleaner.

The air cleaners must be serviced frequently, depending on the dust conditions where the engines are operated. When the oil in the bowl becomes dirty, it should be removed and replaced with new oil. This servicing will vary from a few days of operation in comparatively clean conditions to twice a day in dusty conditions.

Operating the engine under dusty conditions without oil in the air cleaner or with dirty oil, may wear out cylinders, pistons, rings and bearings in a few days time, and result in costly repairs.

At least once a year the air cleaner should be removed from the engine, and the element which is not removable, should be washed in a solvent to clean out the accumulated dust and dirt.

If a collector type pre-cleaner is used on the top of the air cleaner, *Fig. 10,* it should be emptied of accumulated dirt frequently, depending on dust conditions. ***Do not use oil or water in pre-cleaner. This should be kept dry.***

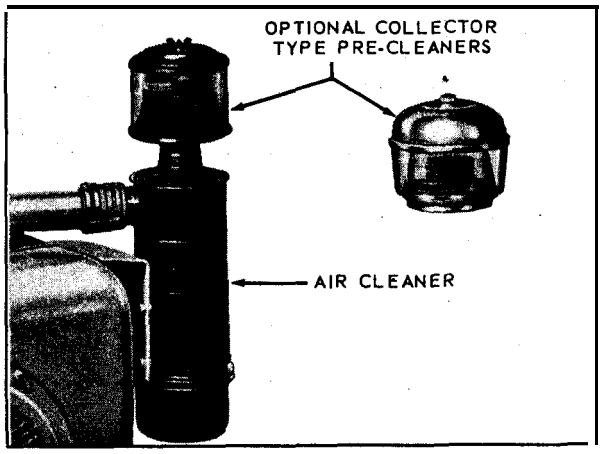


Fig. 10 2I7102C

Daily attention to the air cleaner and pre-cleaner is one of the most important considerations in prolonging engine life.

CARBURETOR ADJUSTMENT

The main metering jet in the carburetor is of the fixed type, and therefore requires no adjustment. The idle needle should be adjusted for beat low speed operation, while carburetor throttle is closed by hand. For further information, refer to Carburetor Manufacturer's Instruction Bulletin in the rear of this manual.

MAGNETO BREAKER POINT ADJUSTMENT

The magneto **break or point gap** is **.015 inch** at full **separation.** If the ignition spark becomes weak after continued operation, the breaker points may have to be readjusted, resurfaced or replaced. Remove the magneto end cover in order to examine the points. If there is evidence of pyramiding or pitting, the points should be resurfaced with a small tungsten file.

Points that are badly worn or pitted should be replaced. Check breaker point gap by rotating the crankshaft with the starting crank, (this also rotates

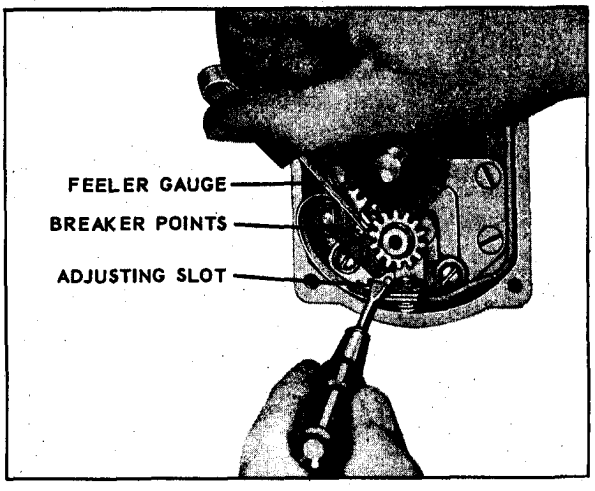


Fig. 11 208070C-A

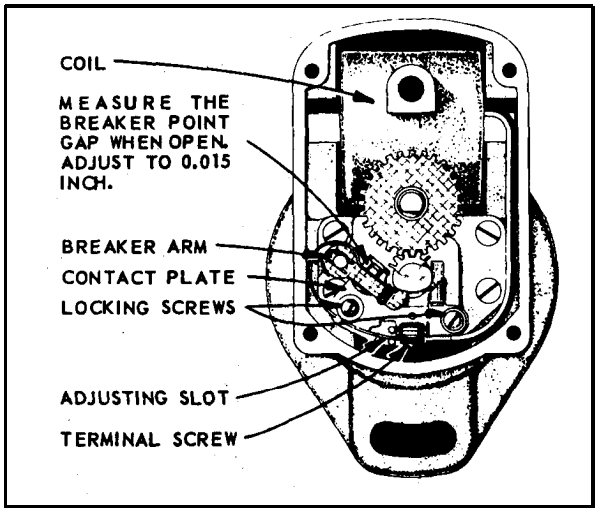


Fig. 12, OPEN END VIEW OF MAGNETO

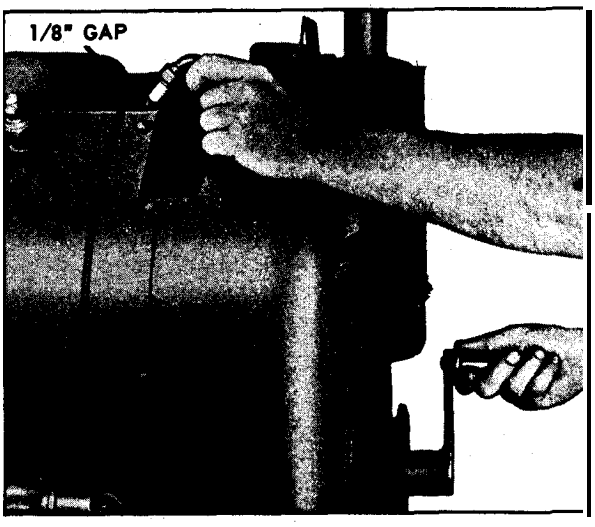
the magneto), until the breaker points are wide open. The opening or gap should then be measured with a feeler gauge as shown in ***Fig. 11.***

Adjust breaker points as follows: First loosen the two **locking screws** on the **contact plate** enough so that the plate can be moved. Insert the end of a smell screw driver into the **adjusting slot** at the, bottom of the **contact plate** and open or close the contacts by moving the plate until the proper opening is obtained, see ***Fig's. 11 and 12.*** After tightening the locking screws, recheck breaker point gap to make sure it has not then gad.

Replace magneto end cover and gasket carefully so that they seal properly. For further information see Fairbanks-Morse magneto maintenance instructions in the rear section of this manual.

MAGNETO IGNITION SPARK

If difficulty is experienced in starting the engine or if engine misses firing, the strength of the ignition spark may be tested by disconnecting the No. 1 igni-



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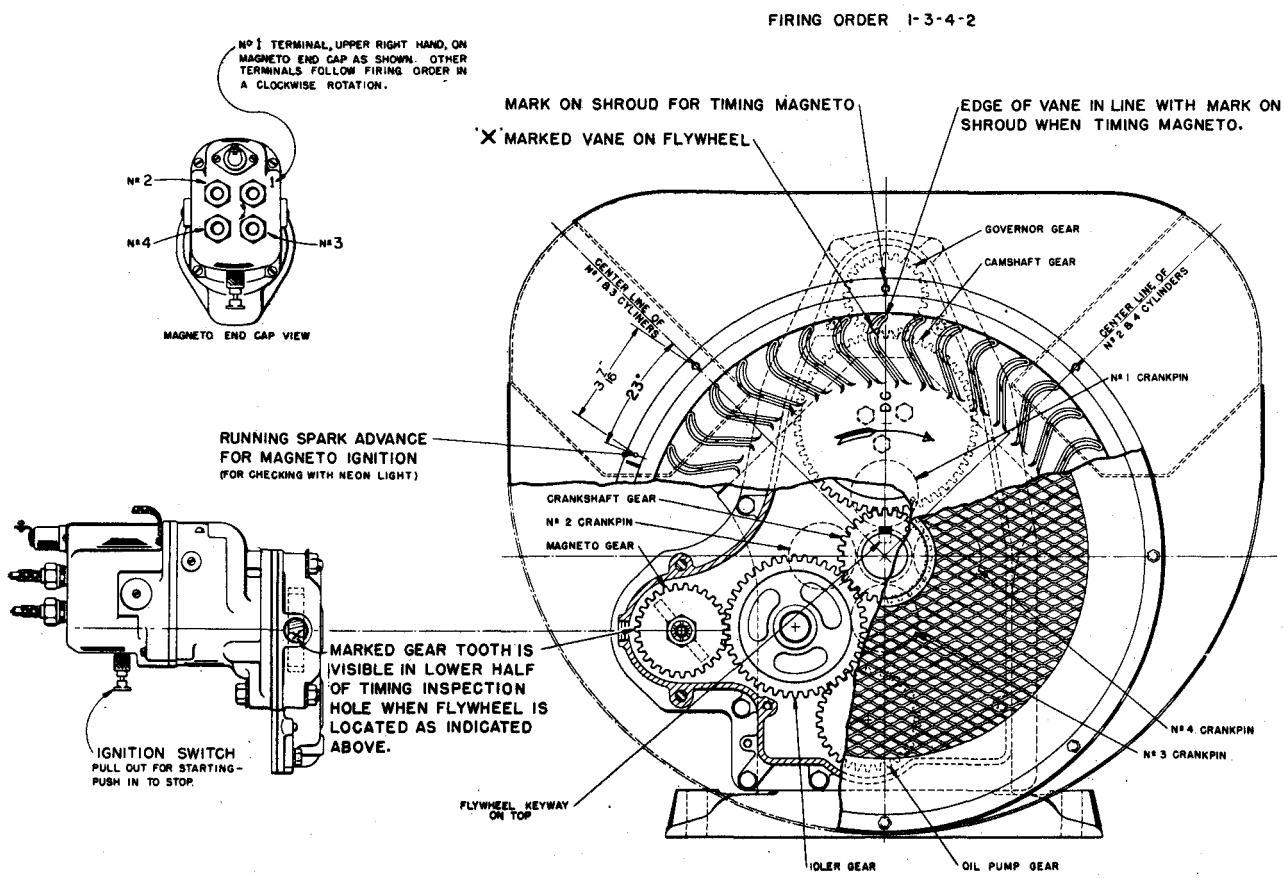


tion cable from the spark plug and holding the terminal 1/8 inch away from the air shroud or any other metal part of the engine, as shown in *Fig. 13.* Turn the engine over slowly by the starting crank two complete revolutions and watch for the spark discharge which should occur during the cycle, at the instant the impulse coupling on the magneto snaps. Repeat this check with each of the other ignition cables. If there is a weak spark, or none at all, check breaker point opening as mentioned in preceding paragraph under ***"Magneto Breaker Point Adjustment".*** If this does not remedy the trouble, it may be necessary to install a new condenser. See Magneto Manufacturer's Maintenance Instructions in the rear of this manual.

MAGNETO TIMING

The magneto is properly timed to the engine at the factory, but if for any reason it is necessary to retime the magneto, it can be done in the following manner

First remove the screen over the flywheel air intake opening by taking out the screws holding the screen in place. This will expose the ***timing marks*** on flywheel and shroud. *See Fig. 14.*

Next, remove the spark plug from No. 1 cylinder and turn the engine over slowly by the starting crank, at the same time holding a finger over the spark plug hole, so that the compression stroke can be determined by the air blowing out of the hole.

The flywheel is marked with the letters **'DC'** near one of the air circulating vanes. This vane is further identified by an **'X'** mark cast on the end. *See Fig. .14.* When the air blows out of the No. 1 spark plug hole, continue turning the starting crank until the edge of the ***marked vane*** on flywheel is on line with the mark on the ***vertical centerline*** of the shroud as shown on *Fig. 14.* Leave flywheel in this position; At this point the keyway for mounting the flywheel is also on top.

Next, remove fitting from ***inspection hole,*** located in the gear cover at the magneto mounting flange, as shown in *Fig. 14.*

Assuming that the magneto has been removed from the engine, the following procedure should be followed before replacing magneto:

The Number 1 cylinder firing position of the magneto must he determined; Insert the ignition cable into the No. 1 tower terminal of the magneto end cap and hold the spark plug terminal at the other end, about 1/8" away from the magneto body. Turn the magneto gear in a clockwise rotation, tripping the impulse coupling until the No. 1 terminal sparks then hold the gear in this position. Mount the magneto to the engine, meshing the gears so that when the magneto is in place, the gear tooth marked with an ***'X'*** will be visible through the lower half of the inspection hole in the gear covet. *See Timing Diagram, Fig. 14.* Tighten the

nut and capscrew for mounting the magneto, making sure the magneto flange gasket is in place.

The No. 1 terminal is the upper right hand tower on the magneto cap. The terminals follow the proper firing order of **1-3-4-2** in a clockwise direction viewing the cap end. The leads from the magneto should be connected to spark plugs of corresponding numbers, see *"Firing Order" paragraph.*

When the magneto is properly timed the impulse coupling will snap when the **'DC'** and ***'X'*** marked vane of the flywheel, lines up with the mark on the flywheel which should indicate the **centerline** of the No. 1 and 3 cylinders. This can be checked by turning crankshaft over slowly by hand. The impulse will also snap every 180° of flywheel rotation thereafter,

The proper spark advance is **23°.** To check timing with a ***neon light,*** the running spark advance is indicated by a l/8" diameter hole on the flywheel shroud, 23° before ***vertical centerline*** of the No. 1 and 3 cylinders. See ***Fig. 14.*** The end of the ***'X'*** marked vane should be whitened with chalk or paint for this operation.

The magneto rotates at crankshaft speed in clockwise direction when viewing driving gear end of magneto. The magneto distributor **rotor turns at half engine speed.**

FIRING ORDER

The ***firing order of*** the cylinder is **1-3-4-2,** and the magneto ***distributor rotor turns at one-half engine speed,*** as is the, case with conventional 'in *line'* engines. The intervals between the firing of the cylinders is 180°. **No. 1** cylinder is the one nearest to the flywheel in the left bank of cylinders, when viewed from the flywheel end of the engine. **No. 3** cylinder is the other cylinder in this bank. **No. 2** cylinder is the one nearest to the flywheel in the right bank of cylinders and **No. 4** is the other cylinder in this bank. The cylinders are numbered from **1** to **4** on the sir shroud near the spark plugs, *see Figs. 1 and 2.* The flywheel end of the engine is designated the front end, and the power take-off end, the rear end of the engine.

SPARK PLUGS - RADIO SHIELDED

The spark plug gap should be thirty thousandths **(.030)** of an inch, and plugs should be kept clean both inside and out. The spark plug thread is 18 millimeter. Be sure to use a good gasket under the spark plug. Tighten spark plugs, 25 to 30 foot pounds torque. Refer to Engine Parts List section for part numbers of replacement spark plugs.

RESTORING COMPRESSION

On a new engine or on one which has been out of operation for some time, the oil may have drained off the cylinder so that compression will be weak. This may cause difficulty in starting. To remedy this condition, remove the spark plugs and pour about a fluid ounce of crankcase oil through the spark plug hole into each cylinder.

Turn the engine over several times with the starting crank to distribute the oil over the cylinder walls, Then replace the spark plugs and compression should be satisfactory.

HIGH TEMPERATURE SAFETY SWITCH

As a safety precaution against overheating, some engines have a high temperature safety switch mounted on the cylinder head near the **No. 2** spark plug. This switch will automatically stop the engine when head temperatures rise beyond a safe degree.

The switch is set by the manufacturer to operate at a predetermined temperature, and consequently, should not be tampered with. If an unusually high cylinder head temperature causes the switch to automatically short out the magneto and stop the engine, a waiting period of about **15** minutes will be required before the switch has cooled off sufficiently to allow the engine to be re-started. An overheated engine will score the cylinder walls, burn out connecting rod and crankshaft bearings, also warp pistons and valves. The cause of the overheating condition will have to be remedied before the engine is re-started. *See* **Engine Overheats** *paragraph in Troubles, Causes and Remedies section.*

TROUBLES CAUSES AND REMEDIES

Three prime requisites are essential to starting and maintaining satisfactory operation of gasoline engines. They are:

1. **A proper fuel mixture** in the cylinder.
2. **Good compression** in the cylinder.
3. **Good spark, properly timed,** to ignite the mixture.

If all three of these conditions do not exist, the engine cannot be started. There are other factors which will contribute to hard starting; such as, too heavy a load for the engine to turn over at a low starting speed, a long exhaust pipe with high back pressure, etc. These conditions may affect the starting, but do not necessarily mean that the engine is improperly adjusted.

As a guide to locating any difficulties which might arise the following causes are listed under the three headings: ***Fuel Mixture, Compression*** and ***Ignition.***

In each case the causes of trouble are given in the order in which they are most apt to occur. In many cases the remedy is apparent, and in such cases no further remedies are suggested.

STARTING DIFFICULTIES

FUEL MIXTURE

No fuel in tank or fuel shut-off valve closed.

Fuel pump diaphragm worn out, so pump does not supply carburetor with fuel.

Carburetor not choked sufficiently, especially if engine is cold.

Water, dirt, or gum in gasoline interfering with free flow of fuel to carburetor.

Poor grade or stale gasoline that will not vaporize sufficiently to form the proper fuel mixture.

Carburetor flooded, caused by too much choking, especially if engine is hot. Crank with choke open.

Dirt or gum holding float needle valve in carburetor open. This condition would be indicated if fuel continues to drip from carburetor with engine standing idle. Often tapping the float chamber of the carburetor very lightly with the wood handle of a screw driver or similar instrument will remedy this trouble. Do not strike carburetor with any metal tools, it may cause serious damage. Also if the mixture in the cylinder, due to flooding, is too rich, starting may be accomplished by continued cranking with the carburet or choke open.

If, due to flooding, too much fuel should have entered the cylinder in attempting to start the engine, the mixture will most likely be too rich to burn. In that case the spark plugs should be removed from the cylinders and the engine then turned over several times with the starting crank, so the rich mixture will be blown out through the spark plug holes. The choke on the carburetor should of course be left open during this procedure. The plugs should be dried off, reassembled, and starting tried again.

To test for clogged fuel line, loosen fuel line nut at carburetor slightly. If line is open, fuel should drip out at loosened nut.

COMPRESSION

If the engine has proper compression, considerable resistance will be encountered in the pull on the starting crank. If this resistance is not encountered, compression is faulty. Following are some reasons for poor compression:

Cylinder dry due to engine having been out of use for some time. See ***'Restoring Compression', Page 14.***

Loose spark plugs or broken spark plug. In this case, a hissing noise will be heard in cranking engine, due to escaping gas mixture on compression stroke.

Damaged cylinder head gasket or loose cylinder head. This will likewise cause hissing noise on compression stroke.

Valve stuck open due to carbon or gum on valve stem. To clean valve stems, ***See 'Valves', Page 20.***

Valve tappets adjusted with insufficient clearance under valve stems. ***See 'Valve Tappets', Page 21.***

Piston rings stuck in piston due to carbon accumulation. If rings are stuck very tight this will necessitate removing piston and connecting rod assembly and cleaning parts. ***See 'Piston and Connecting Rod', Page 19.***

Scored cylinders. This will require reboring of the cylinders and fitting with new pistons and rings. If scored too severely, an entirely new cylinder block may be necessary.

IGNITION

See 'Magneto ignition Spark', Page 12. No spark may also be attributed to the following:

Ignition cable disconnected from magneto or spark plugs.

Broken ignition cables, causing short circuits.

Ignition cables wet or oil soaked.

Spark plugs wet or dirty.

Spark plug point gap wrong. See ***Page*** 14.

Condensation on spark plug electrodes.

Magneto breaker points pitted or fused

Magneto breaker arm sticking.

Magneto condenser leaking or grounded.

Spark timing wrong. See 'Magneto ***Timing',*** Page 13.

ENGINE MISSES

Spark plug gap incorrect. See ***Page*** 14.

Worn and leaking ignition cables.

Weak spark. See ***'Magneto Ignition Spark', Page 12.***

Loose connections at ignition cable.

Magneto breaker points pitted or worn.

Water in gasoline.

Poor compression. See ***'Compression', Page 15.***

ENGINE SURGES OR GALLOPS

Carburetor flooding.

Governor spring hooked into wrong hole in lever, or governor rod incorrectly adjusted. See ***'Governor Adjustment', Page 22.***

ENGINE STOPS

Fuel tank empty.

Water, dirt or gum in gasoline.

Gasoline vaporized in fuel lines due to excessive heat around engine (Vapor Lock). See 'Stopping ***Engine', Page 11.***

Vapor lock in fuel lines or carburetor due to using winter gas (too volatile) in hot weather.

Air vent hole in fuel tank cap plugged. Engine scored or stuck **due to lack of oil.**

Ignition troubles. See *'Ignition', Page 15.*

ENGINE OVERHEATS

Crankcase oil supply low. Replenish immediately.

Ignition **spark timed wrong. See *'Magneto Timing', Page 13.***

Low grade of gasoline.

Engine overloaded.

Restricted cooling air circulation.

Part of air shroud removed from engine.

Dirt between cooling fins on cylinder or head,

Engine operated in confined space where cooling air is continually recirculated, consequently becoming too hot.

Carbon in engine.

Dirty or incorrect grade of crankcase oil.

Restricted exhaust.

Engine operated while detonating due to low octane gasoline or heavy load at low speed.

ENGINE KNOCKS

Poor grade of gasoline or of low octane rating. See ***'Fuel', Page 9.***

Engine operating under heavy load at low speed.

Carbon or lead deposits in cylinder head.

Spark advanced too far. ***See 'Magneto Timing', Page 13.***

Loose or burnt out connecting rod bearing,

'Engine overheated due to causes under previous heading.

Worn or loose piston pin.

ENGINE BACKFIRES THROUGH CARBURETOR

Water or dirt in gasoline.

Engine cold.

Poor grade of gasoline.

Sticky inlet valves. ***See 'Valves', Page 20,***

Overheated valves.

Spark plugs too hot.

Hot carbon particles in engine.

DISASSEMBLY AND REASSEMBLY OF MVG4D ENGINE

Engine repairs should be made only by a mechanic who has had experience in such work. When disassembling the engine it is advisable to have several boxes available so that parts belonging to certain groups can be kept together, such as, for instance, the cylinder head screws, etc. Capscrews of various lengths are used in the engine, therefore great care must be exercised in reassembly so the right screw will be used in the proper places.

Tighten the cap screws and nuts of the manifolds, cylinder heads, gear cover, oil pan, connecting rods, cylinder blocks, main bearing plate and the spark plugs to the specified torque readings indicated in the following paragraphs of reassembly.

While the engine is partly or fully dismantled, all of the parts should be thoroughly cleaned. Remove all accumulated dirt between the fins.

If it is desired to disassemble the engine, the following order should be substantially adhered to. As disassembly progresses, the order may be altered somewhat if desired, as will be self-evident to the mechanic. Reassembly of the engine should be made in the reverse order.

TESTING REBUILT ENGINE

An engine that has been completely overhauled, such as having the cylinders rebored and fitted with new pistons, rings and valves, should go through a thorough "run-in" period, before any amount of load is applied to the engine.

The engine should be started and allowed to run for about one-half hour, at about 1200 to 1400 R.P.M. without load. The R.P.M. should then be increased to engine operating speed, still without load, for an additional three and one-half to four hours.

The proper "running-in" of the engine will help to establish polished bearing surfaces and proper clearances between the various operating parts and thus add years of trouble free service to the life of the engine.

ACCESSORIES

The air cleaner, oil filter, magneto, and if an electric starter and generator are used, these should be removed first. Clean and repair before reassembly.

Remove clutch or clutch reduction unit if engine is equipped with either of these accessories.

SHEET METAL HOUSE

On power units; engine which are enclosed in a sheet metal house, remove the muffler end canopy first. Disconnect air cleaner, choke, governor control and instrument wires at the front house panel. The front panel can be removed as part of the flywheel shroud, as explained in the following paragraphs of disassembly.

FLYWHEEL

After the flywheel screen has been removed, the flywheel nut and the generator drive pulley should be taken off. Then as shown in ***Fig. 15,*** the flywheel can be removed from the crankshaft.

Take a firm hold on the flywheel fins, pull outward and at the same time strike the end of the crankshaft with an aluminum hammer. See ***Fig. 15.*** The flywheel will slide off the taper of the crankshaft. Do not use a hard hammer as it may ruin the crankshaft and bearings. When reassembling the flywheel, be sure the Woodruff key is in position on the shaft and that the keyway in the flywheel is lined up accurately with the key.

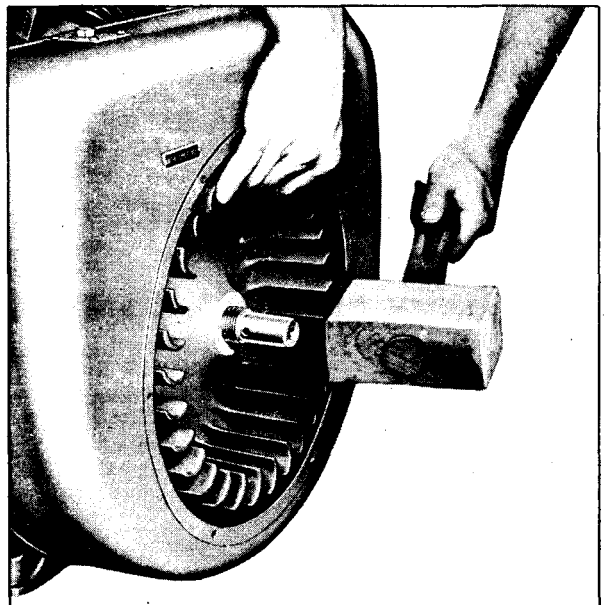


Fig. 15 76696C

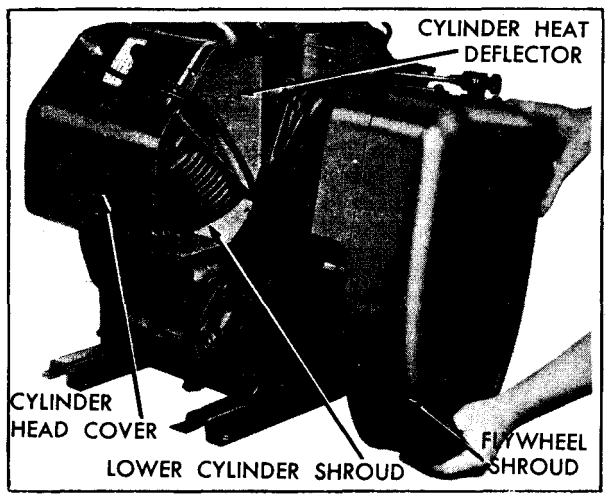


Fig. 16 104811C

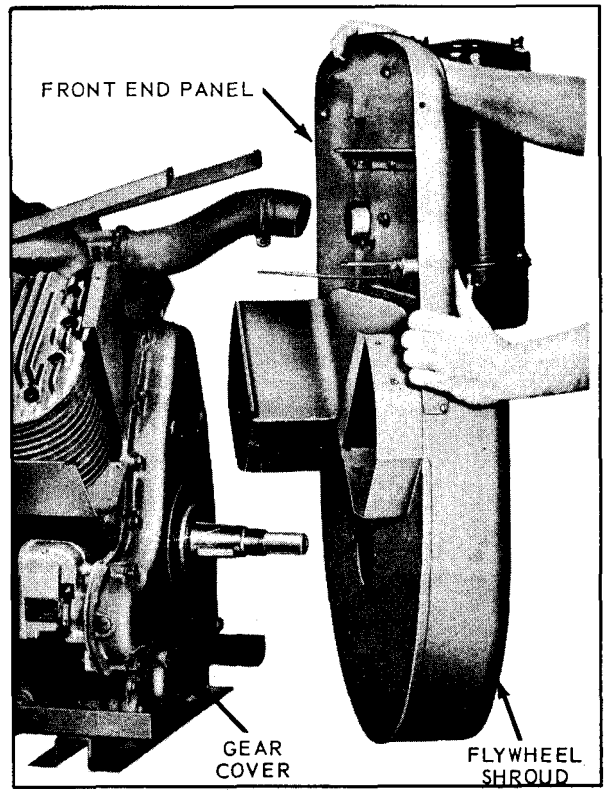


Fig. 17 180184C

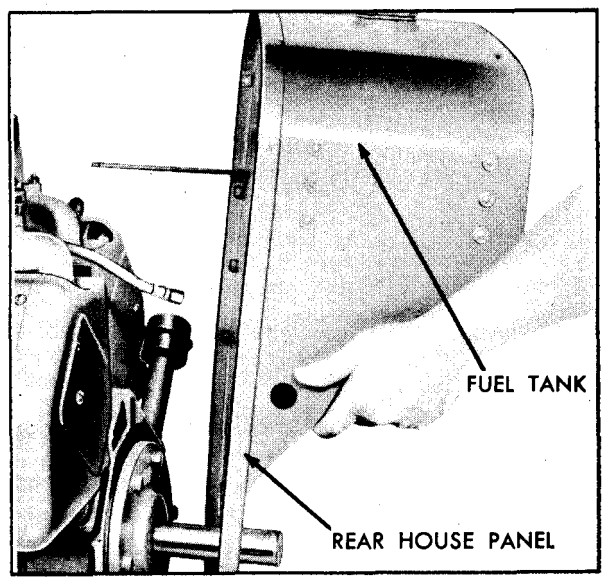


Fig. 18 71050C

AIR SHROUDING

To disassemble air shrouding, refer to *Fig. 16.* First remove cylinderhead covers and the screws mounting the flywheel shroud to the lower cylinder shrouds and cylinder heat deflectors; then remove the screws holding the flywheel shroud to gear cover.

On power units, remove the front end panel as shown in *Fig. 17,* together with flywheel shroud. Disassemble rear end panel, as shown in *Fig. 18,* complete with fuel tank. Balance of shrouding can now be readily removed.

FUEL TANK

If a side mount gasoline tank is used, this should be removed next. See *Fig. 19.*

CARBURETOR AND MANIFOLDS

The carburetor and manifold can be removed as a complete unit as shown in *Fig. 20.*

In reassembly, tighten the nuts for mounting the manifolds, 40 to 50 foot pounds torque. Tightening beyond specification may cause the flanges to break.

CYLINDER HEAD

The cylinder head must be removed if it is necessary to regrind valves, or to do work on the piston, rings or connecting rod. All of the cylinder head screws are plainly in view and can be easily removed. Screws

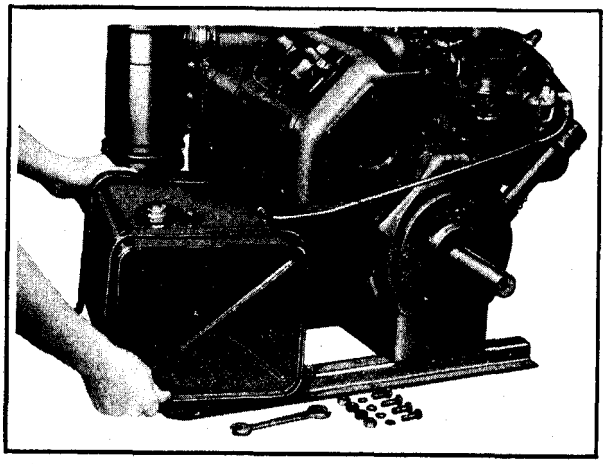


Fig. 19 83608C

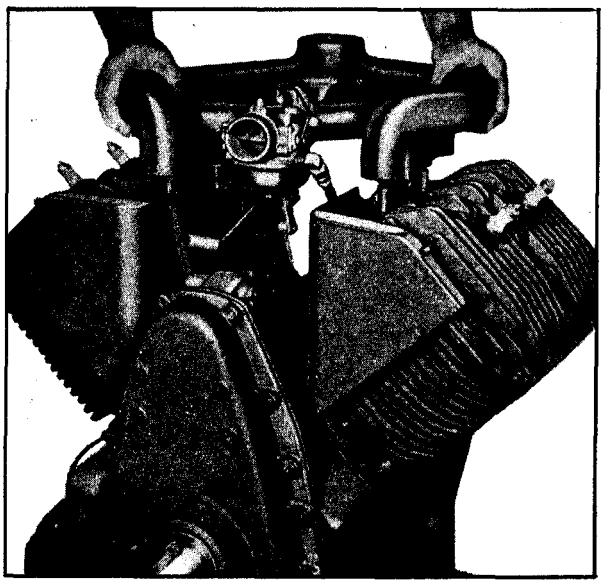


Fig. 20 104579C

of different lengths are used but these can be properly reassembled according to the various lengths of cylinder head bosses.

Before reassembling the cylinder head, all carbon and lead deposits should be removed. It is recommended that a new cylinder head gasket be used on reassembly as the old gasket will be compressed and hard so that it may not seal properly. Use a mixture of graphite and oil on the cylinder head screws, to prevent them from rusting tight against the cylinder block. Tighten cylinder head screws, 25 to 32 foot pounds torque, and after complete assembly and engine is run in, retorque head screws.

GEAR COVER

Disconnect the governor linkage and remove the governor assembly. Remove gear cover screws and drive out the two dowel pins as shown in ***Fig.*** **21.** The gear cover can then be taken off, exposing the timing gears as shown in ***Fig. 22.*** In reassembly, tighten gear cover capscrews, 14 to 18 foot pounds torque.

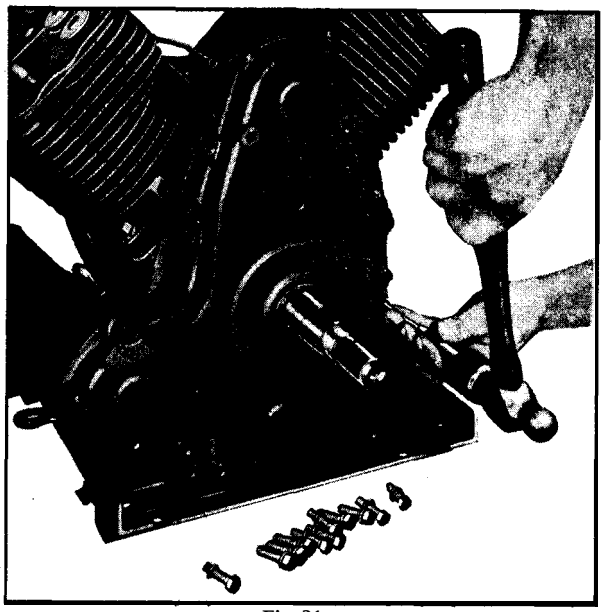


Fig. 21 71056C

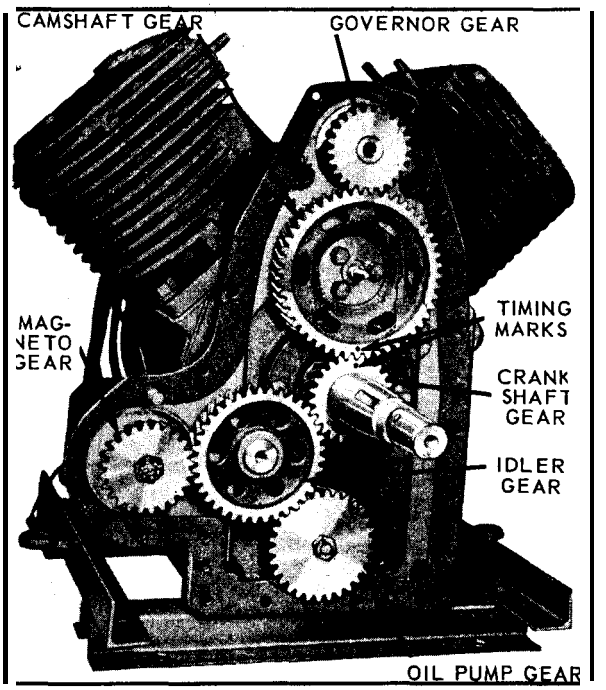


Fig. 22 104716C-1

GEAR TRAIN

With the removal of gear cover and oil sling the gear train will be exposed as shown in Fig. 22. Remove camshaft thrust plunger and spring, to prevent their being lost.

Future reference can be made to ***Fig. 22*** when assembling crankshaft and camshaft, as accurate location of the timing marks is essential.

IDLER GEAR AND SHAFT

Remove the Allen-head set screw, on the magneto side of the crankcase, which locks the idler shaft in position. With the use of a gear puller, the idler

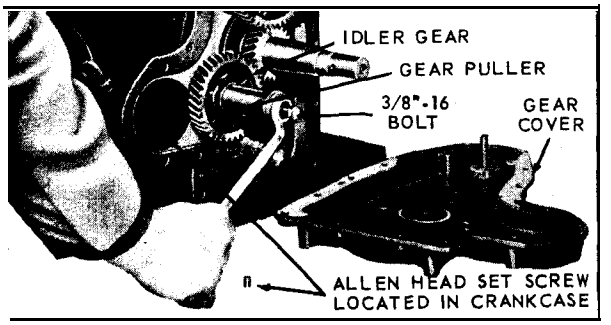


Fig. 23 71066C

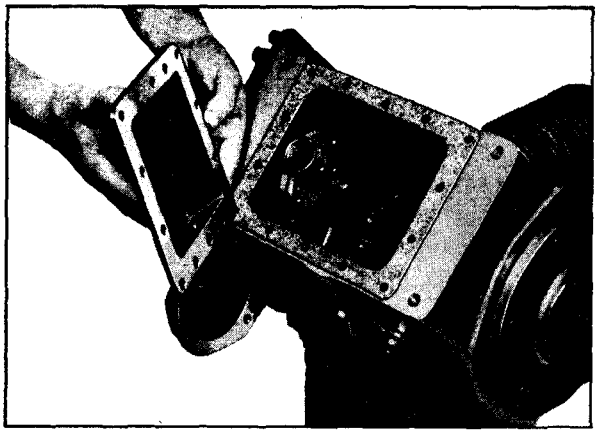


Fig. 24 104721C

shaft and idler gear assembly can be removed from the crankcase. *See Fig. 23.*

In reassembly; be sure oil groove in shaft is facing up. Drive shaft into crankcase with soft metal hammer and maintain a **.003** to **.004 inch** clearance between idler gear and shoulder of shaft.

OIL PAN

The engine can now be inverted so that the supports and oil pan can be removed. *See Fig. 24.*

In reassembly, mount deep end of oil pan toward oil pump. Tighten mounting screws, 6 to 9 foot pounds torque.

OIL PUMP

To remove oil pump, first take out the slotted pipe plug, and then with a 5/32 inch Allen wrench, remove the oil pump lockscrew, as shown in *Fig. 25.* Remove locknut holding oil pump driving gear to shaft. Then, with a soft brass rod or punch, drive shaft through gear as shown in *Fig. 26.* The oil pump can then be withdrawn toward center of crankcase.

PISTONS AND CONNECTING RODS

After removal of the oil pump, all of the connecting rod bolts will be accessible. Remove the palnuts and hexagon nuts, then by tapping the ends of the bolts lightly, being careful not to mar the threads, the connecting rod cap can be freed from the bolts. The rod with the piston can now be pushed up through the cylinder. Be careful not to score the crankshaft journals, by allowing the rod bolts to strike or scrape across them, when removing the connecting rod and piston assemblies. Replace the caps on the rods immediately so that they are in the correct position for reassembly. A number is stamped on the side of the rod and cap to match each connecting rod with its corresponding cap. These numbers must be on identical sides of the rod in reassembly. *See Fig. 27.*

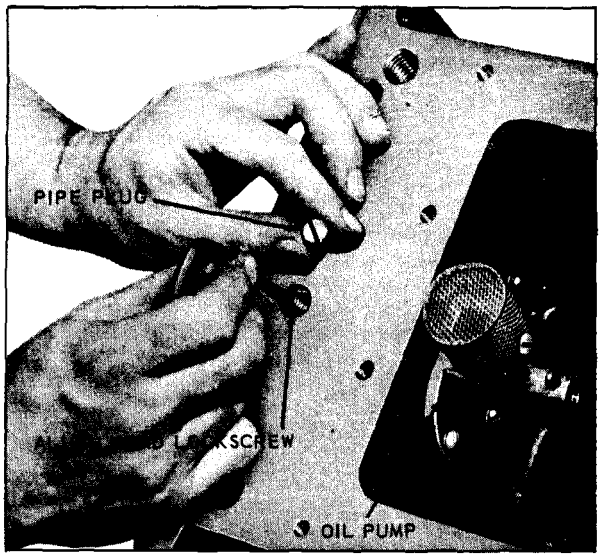


Fig. 25 180178C

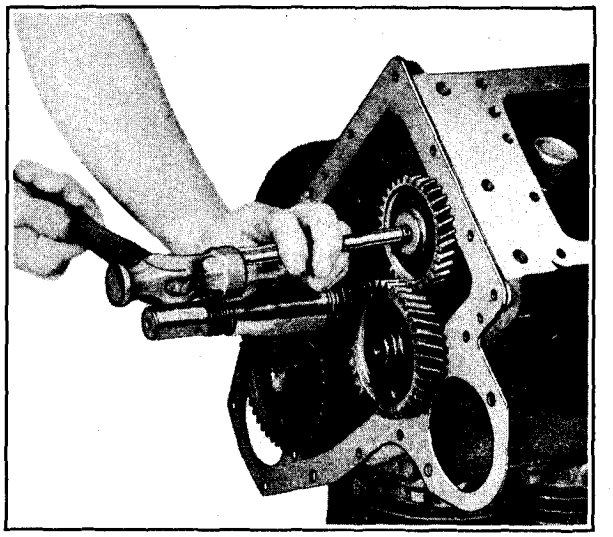


Fig. 26 83615C

The connecting rods have removable shell bearings and care should be taken in reassembly that they are in place in the rod and cap. When replacing the shell bearings, be sure and replace a complete bearing (2 halves).

The piston skirt is ***cam-ground*** to an elliptical contour. Clearance between the piston and cylinder must be measured at the center of the thrust face of the piston skirt. Refer to Chart, *Fig. 30,* for proper clearante. The thrust faces on the piston skirt are 90° from the axis of the piston pin hole. See *Fig. 28.*

When reassembling the piston and connecting rod to

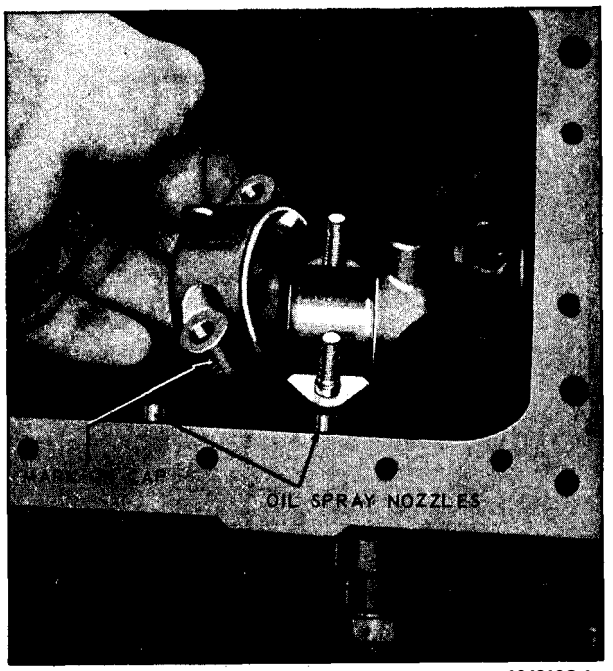


Fig. 27 104819C-1

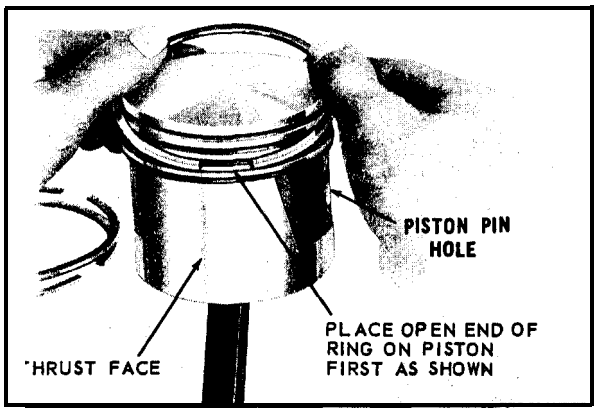


Fig. 28 71152C

the engine, be sure the ***arrow*** on the top of the piston is pointing in the direction of crankshaft rotation. (Clockwise when viewing the flywheel end of the engine). *See Engine Sectional, Fig. 3.*

Tighten connecting rod nuts, 28 to 32 foot pounds torque, then install 'Pal' locknuts and tighten with wrench 1/4 turn beyond 'finger-tight' position.

Be sure piston and connecting rod assemblies are put back into the same bore from which they were removed.

PISTON RINGS

Install rings by placing the open end of the ring on piston first, as shown in *Fig. 28.* Spread ring only far enough to slip over piston and into correct groove, being careful not to distort ring.

The Number 2 compression ring must be installed on the piston with the scraper edge down, otherwise oil pumping and excessive oil consumption will result, *See Fig. 29.*

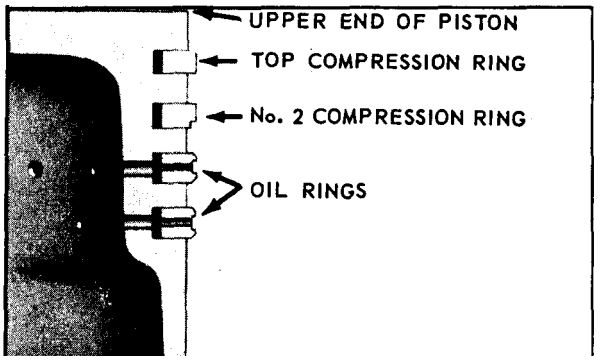


Fig. 29 209574C

Use a suitable ring compressor in reassembly and stagger the piston ring gaps 90° apart around the piston. Oil the pistons, rings, wrist pin, rod bearings and cylinder walls before assembly.

CYLINDERS

The cylinder blocks can now be removed from the crankcase if necessary. In reassembling, put the blocks back on the same side from which they were removed. Clean all dirt and other deposits from fins before reassembling. If the cylinders are worn more than .005 inch oversize, they should be reground and fitted with oversize pistons and rings.

Tighten cylinder block mounting nuts, 62 to 78 foot pounds torque.

VALVES

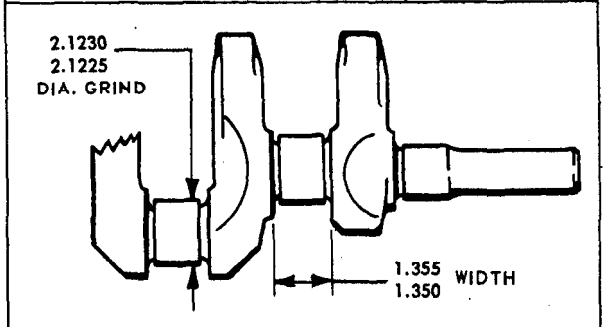
Remove the valve tappet inspection plate and compress the valve springs with a standard automotive type valve lifter, as shown in *Fig. 31.* If cylinder block is still attached to the engine, insert a rag in the opening at the bottom of the valve chamber so the roto-cap and valve spring seat retaining locks do not fall into the crankcase. Remove the roto-caps, valve spring seat retaining locks, seats, springs, valves and clean these, as well as the ports and guides, of all carbon and gum deposits. Tag each valve so that in reassembly they will be mounted in the same guide they were removed from.

Non-positive type roto-caps are provided on the ends of the valve stems. In reassembly, be sure to assemble the roto-caps to the end of the valve stems.

The valve face is ground at 45° to the vertical center line of the valve stem and the valve seat insert should also be ground at a 45° angle. After grinding valves and inserts should be lapped with a suitable lapping compound or they will leak due to improper seating within the first few hours of operation. After valve seats have been cleaned, apply lapping compound to the valve face and put the valves back into their guides. Lap the valves by rotating them back and forth with a reciprocating advancing valve tool. Occasional lift the valves and reseat them in a different position to insure a uniform seat which will show entirely around the valves. After valves have been lapped in evenly, remove them from the block and wash the valves and block thoroughly with gasoline or kerosene.

PISTON, RING AND ROD CLEARANCES CHART

PISTON TO CYLINDER AT PISTON SKIRT THRUST FACES		.0052 to .0062"
PISTON RING COMPRESSED GAP		.025 to .035"
PISTON RING SIDE CLEARANCE IN GROOVES	Top Ring	.002 to .004"
	2nd Ring	.0015 to .0035"
	3rd, 4th Groove Oil Rings	.001 to .003"
CONNECTING ROD TO CRANK PIN – SIDE CLEARANCE		.008 to .015"
CONNECTING ROD SHELL BEARING TO CRANK PIN		.0015 to .003"
PISTON PIN – TO PISTON TO CONNECTING ROD BUSHING		.0000 to .0003" .0002 to .0007"



STANDARD CRANK PIN DIMENSIONS

Fig. 30

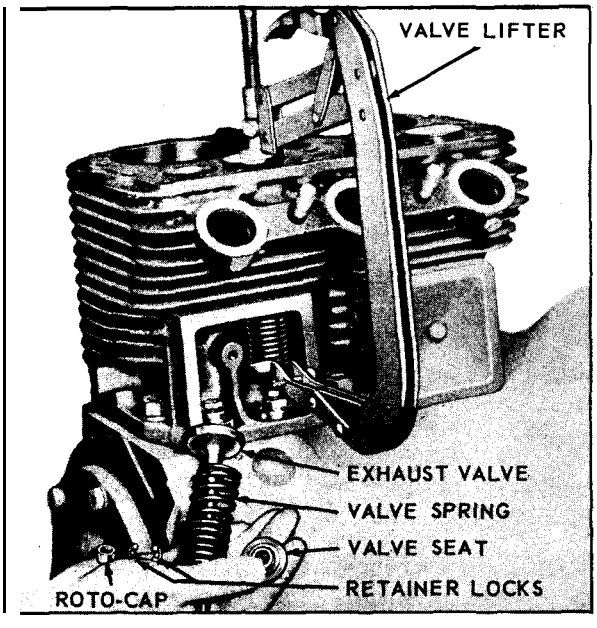


Fig. 31 189221 C

The cylinder blocks have replaceable valve guides. The valve stems have a clearance of .0025" to .0045" in the guides. When the clearance becomes .008", the guides should be driven out and replaced with new guides.

The valves and valve seat inserts are of 'Stellite' material.

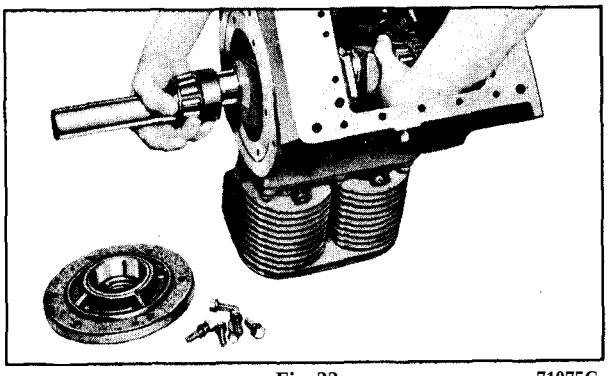


Fig. 32 71075C

CRANKSHAFT

To remove the crankshaft, first remove the six capscrews in the main bearing plate at the take-off end of the engine. The plate can then be pried off and the crankshaft removed from that end of crankcase. *See Fig. 32.* Be sure to keep shims and gaskets in place as these are necessary to give the proper end play to the tapered roller bearings on the crankshaft. This end play should be **.002** to **.004** inch when engine is cold. There is practically no wear in these bearings so that no readjustment is necessary after proper assembly.

When reassembling crankshaft, the timing marks on the crankshaft gear and camshaft gear must match up, *see Fig. 22,* otherwise engine will not operate properly, or if timing is off considerably, engine will not run at all.

Mount main bearing plate in the correct position in reassembly. The word **'TOP'** is cast on the outside of the plate, and should be mounted in this position. Mounting the main bearing plate upside down would prevent the main bearing from being properly lubricated. Tighten main bearing plate capscrews, 25 to 30 foot pounds torque.

CAMSHAFT

Remove all valve tappets and withdraw camshaft from crankcase. *See Fig. 33.* When replacing, be sure the spring and plunger are in place in the end of the camshaft, as these hold the camshaft in position endwise.

Camshaft gear is removed by taking out the three screws and lockwashers, and then prying the gear off the end of the camshaft. The camgear has offset mounting holes to provide accurate assembly for valve timing. The gear can only be put on the correct way for matching up the timing mark with that of the crankshaft. *See Gear Train, Fig. 22.*

VALVE TAPPETS - ADJUSTMENT

The valve tappets must be pulled out before the camshaft is removed. In reassembly, the tappets can be inserted in proper position in the crankcase after the camshaft is reassembled. *See Fig. 33.*

After the cylinder block assemblies have been mounted to the crankcase, the tappets should be adjusted.

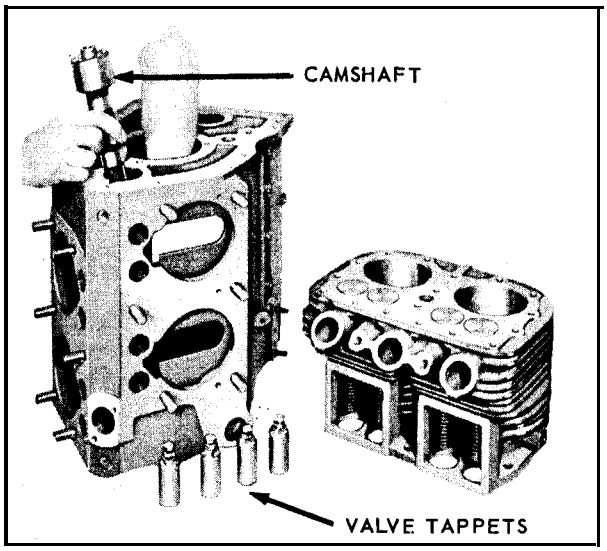


Fig. 33 104569C

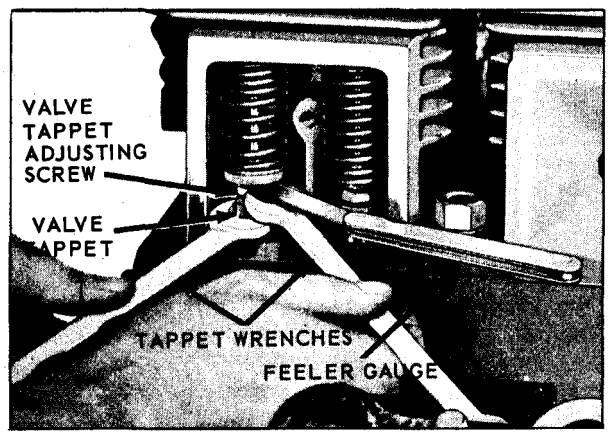


Fig. 34 180186C

See Fig. 34. With the tappets in their lowest positions, engine cold, the clearance should be:

Inlet Valves .008", Exhaust Valves .016"

GOVERNOR - OPERATION

The centrifugal flyball governor rotates on ball-bearing supported shaft in the upper part of the timing gear cover, and the governor is driven off the camshaft gear at 1-1/8 times crankshaft speed.

The flyweights are hinged to lugs on a drive hub behind the gear. Hardened pins on the flyweights bear against the flanged sliding sleeve, moving it back and forth as the flyweights move in or out. The motion of the sleeve is transmitted through a ball thrust bearing to the governor lever, which in turn is connected to the carburetor throttle lever. A spring connected to the governor lever tends to hold the governor flyweights to their ***inner*** position, also to hold the carburetor throttle open. As the engine speed increases, the centrifugal force in the flyweights acts against the spring and closes the throttle to a point where the engine speed will be maintained practically constant under varying load conditions. This speed can be varied to suit conditions by adjusting the governor spring tension to suit.

FULL LOAD R.P.M.	NO LOAD R.P.M.	HOLE "No"
1400	1550	4
1500	1650	5
1600	1725	5
1700	1850	6
1800	1950	7
1900	2050	8
2000	2125	8
2100	2250	9
2200	2350	10
2300	2425	10
2400	2550	11

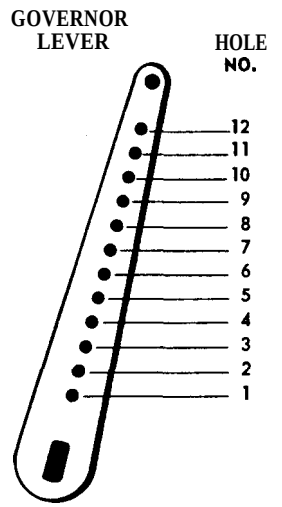


Fig. 35

GOVERNOR ADJUSTMENT

The control rod between the governor and carburetor must be adjusted to the proper length, otherwise governor action will be faulty. With the engine at rest the governor spring will hold the flyweights in, and the control rod must be of such length as to hold the carburetor throttle wide open at that point. The accuracy of this adjustment can be tested by disconnecting the control rod ball joint from the governor lever, and then pushing the rod assembly toward the carburetor *as* far as it will go. This will open the throttle wide. The governor lever should then be moved as far as possible in the same direction. Holding both parts in the above position, the ball joint should be screwed on to the control rod until the right angle stud on the ball joint fitting will register with the hole in the lever, then, screw fitting in two more turns. Insert ball joint stud into the hole in the governor lever, assemble and tighten locknuts. With the governor lever pushed toward the carburetor as far as it will go, there should be about a 1/16 inch clearance between the throttle lever and the stop pin on the carburetor. The clearance will cause the lever to bounce back from the stop pin, rather than jam against the pin, when a load is suddenly applied to an idling engine. This will eliminate excessive wear on the threads of the control rod and ball joints.

The governor can be disassembled from the engine by first removing the governor housing, after which the entire governor can be withdrawn from the gear cover. The constuction of the governor can be best seen from the sectional drawing of the engine, ***Fig. 3.***

The governor lever is furnished with 12 holes for attaching the governor spring as shown in ***Fig. 35.*** It is very important that the spring is hooked into the proper hole to suit the speed at which the engine is operated. The Governor Lever Chart, ***Fig. 35,*** shows

the ***full load*** and ***no load*** speeds of the engine and the hole corresponding thereto. The full load speed will be from 150 to 125 revolutions less than the no load speed. As an example, if the engine is to be operated at 2000 revolutions per minute under load, the spring should be hooked into the 8th hole in the governor lever and the spring tension adjusted by means of the adjusting screw connected to the spring, to run 2125 revolutions per minute, without load. The speed at full load will then be approximately 2000 revolutions per minute. A tachometer or revolution counter should be used against the crankshaft while adjusting the governor spring tension to give the proper engine speed.

CLUTCH AND REDUCTION UNITS

CLUTCH POWER TAKE-OFF

The clutch furnished with this model of engine is of the dry disc type. No oil should be put into the clutch housing. There are three points on these clutches requiring lubrication and these are filled with grease at the factory, *see Fig. 36.* ***Grease gun fittings*** are furnished for periodic lubrication. The ***housing bearing*** and ***pilot bearing*** should receive additional grease every fifty hours of operation. The clutch ***throwout bearing*** should be greased every day before starting. Use Mobil Gargoyle grease BRB No. 3, Sinclair AF-1 grease, or equal.

CLUTCH ADJUSTMENT

If the clutch begins to slip, it should be readjusted, otherwise it would become overheated and damaged. First release clutch operating lever and remove clutch inspection plate. For the ***Rockford clutch,*** turn clutch over until ***adjusting ring lock*** is up. Release lock with a screw driver or similar tool as shown in *Fig. 37.* The adjusting ring should then be turned in a clockwise direction one notch at a time until a very firm pressure is required to engage the clutch by the operating lever. Take-off shaft must be kept from turning when making this adjustment. Be sure to re-engage the adjusting ring lock into a notch in the ring. Replace inspection cover.

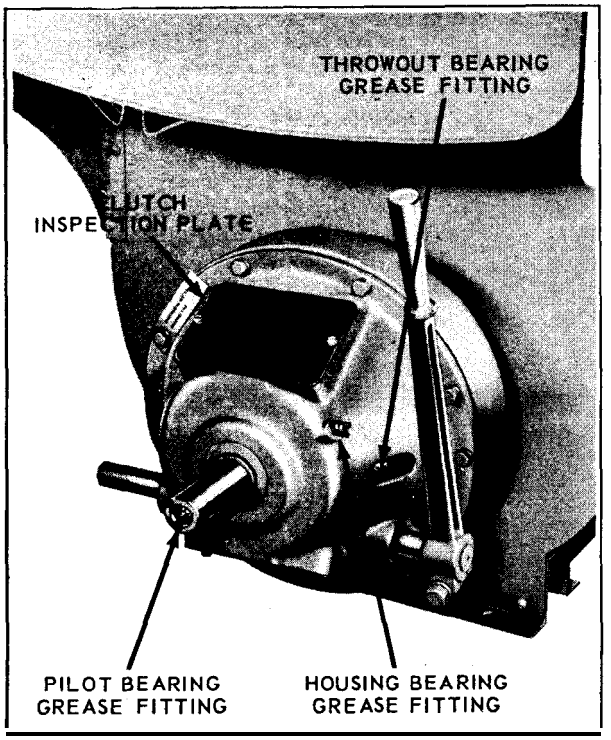


Fig. 36 **104570C**

For the ***Twin Disc clutch,*** pull adjusting lockpin out, as shown in *Fig. 38,* and turn the adjusting yoke in a clockwise direction until the operating lever requires a distinct pressure to engage.

CLUTCH REDUCTION GEARS

Clutch reduction gears are furnished with several different ratios, some with spur gears, for counter-enginewise rotation, others with internal gears, for enginewise rotation. The clutch is of the dry disc type and ***no oil should be put into the clutch housing.***

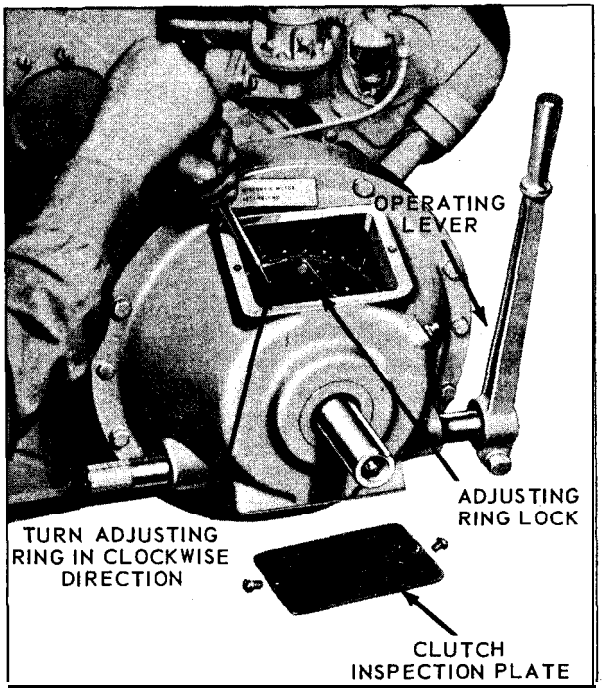


Fig. 37 104574C

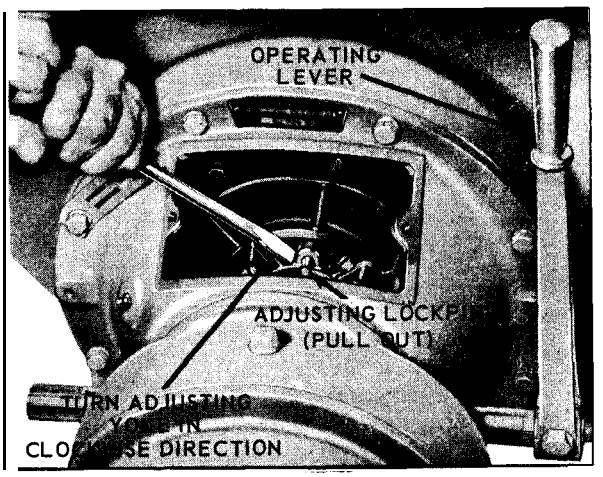


Fig. 38 104578C

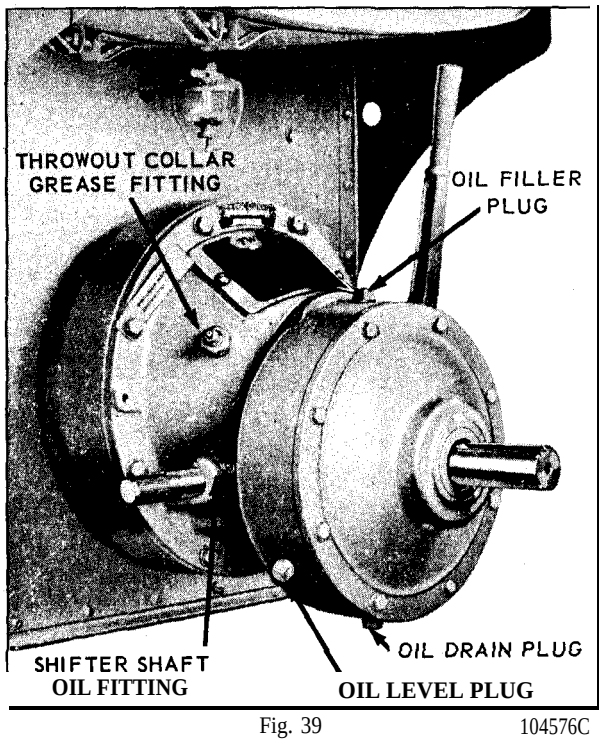


Fig. 39 104576C

The ***throwout collar*** should be lubricated once a day before starting. Add grease to fitting on side of housing, as illustrated in *Fig. 39*, using the same type grease as used in the clutch power take-off units. Twin Disc units have an external grease fitting for the throwout bearing.

The shifter shaft should be lubricated periodically, if external oil fittings are provided for this purpose.

The reduction unit is operated in oil and the gear case oil level must be maintained to the ***oil saber gauge*** or ***plug,*** *see Fig. 39.* In ***Twin Disc*** units, high grade transmission oil S.A.E. No. 90 to No. 110 Viscosity must be used. For ***Rockford*** units, use No. 30 S. A. E. crankcase oil. Change oil every 2000 hours of service, while unit is warm.

If clutch slips, heats, or operating lever jumps out, the clutch must be adjusted. Release clutch operating lever and remove hand hole plate. The clutch in the clutch reduction units is the same as is used in the clutch power take-off units. Refer to "Clutch Adjustment" paragraph for adjustment of the clutch in the ***Twin Disc*** and ***Rockford*** clutch reduction units. A new clutch generally requires several adjustments until the friction surfaces are worn in.

INSTRUCTIONS FOR PROTECTING ENGINE DURING PERIODS OF STORAGE

When the work interval is completed, the following instructions should be carried out very carefully to protect the engine during the storage period.

The outside of the engine, including the cooling fins on the cylinders and heads, should be thoroughly cleaned of all dirt and other deposits.

The air cleaner should be cleaned of all oil and accumulated dust, and the sediment removed from the oil cup at the bottom of the cleaner.

To protect the cylinders, pistons, rings and valves and keep them from rusting and sticking, a rust preventative oil, as specified under Military Specification MIL-0-6082, (Type 1, ready mixed, or equivalent) should be injected into the pipe tap opening on the intake manifold while the engine is warm and running at moderate speed. About a quarter of a pint is necessary on a four cylinder engine, or enough so that a heavy bluish smoke will appear at the exhaust. The ignition switch should then be shut off and the engine stopped. This operation will leave a coating of oil on the above mentioned parts, protecting them from the atmosphere.

On engines where the pipe tap opening on the intake manifold is inaccessible, the rust preventative may be injected into the air intake on the carburetor while the engine is running. The air cleaner connection will of course have to be disconnected from the carburetor to do this.

Remove plug from crankcase bottom cover and drain oil. Drain while engine is warm, as the oil will then flow much more freely than when cold.

Drain fuel system, including gasoline lines, carburetor, fuel pump and tank of all gasoline, to prevent lead and gum deposits from forming.

All exposed unpainted metal parts should be coated with grease or heavy oil.

The air cleaner or carburetor intake, as well as the exhaust manifold and breather openings, should be taped or otherwise sealed off for the duration of the storage period.

Before starting the engine after the storage period, remove crankcase drain plug so that any condensation which may have collected may be drained before new crankcase oil is added. It is highly recommended that the crankcase bottom cover be removed before starting the engine, and scrubbing off all sediment which may have collected there. When reassembling the bottom cover a new gasket should be used.

Be sure to fill crankcase with the correct grade of oil to the full mark on the saber. Do not use any oil heavier than SAE No. 30. Also be sure to put oil to the proper level in the air cleaner. *(Refer to Lubrication and Air Cleaner.)*

Refuel engine and follow the starting instructions as shown on preceding pages of this manual.

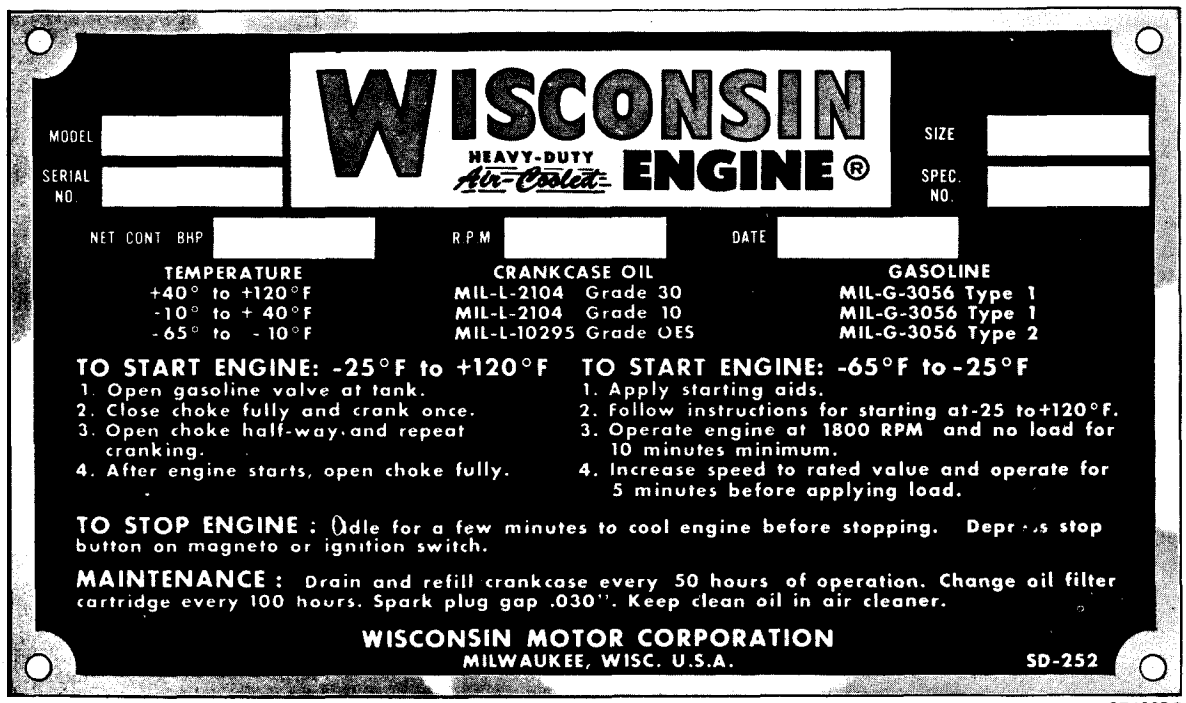
It is suggested that machines be stored inside a building. If this is not possible, the engine should be protected from the weather by a proper covering.

REPAIR PARTS LIST

READ THESE INSTRUCTIONS BEFORE ORDERING PARTS

THE MODEL, SPEC AND SERIAL NUMBER OF YOUR ENGINE, SHOWN ON THE NAME PLATE ATTACHED TO THE AIR SHROUD, MUST BE GIVEN WHEN ORDERING PARTS.

FILL IN THE ABOVE INFORMATION ON THE PHOTO OF THE NAME AND INSTRUCTION PLATE SO THAT IT WILL BE AVAILABLE TO YOU WHEN ORDERING PARTS.



276192C

TO INSURE PROMPT AND ACCURATE SERVICE, THE FOLLOWING INFORMATION MUST ALSO BE GIVEN.

1. State exactly, quantity of each part and part number.

2. State definitely, whether parts are to be shipped by express, freight or parcel post.

SERVICE FACILITIES

Approved engine service stations, located throughout the U.S. and foreign countries, have been carefully selected by the WISCONSIN MOTOR CORPORATION in order to assure complete and efficient repair and inspection service to owners of Wisconsin Air Cooled Engines. These service stations, equipped and trained for complete engine repair, also stock parts to facilitate immediate delivery for all Wisconsin Air Cooled Engines.

A DIRECTORY OF SERVICE STATIONS CAN BE FOUND IN THE BACK OF THIS MANUAL.

PARTS RETURNED FOR CREDIT

Before returning any parts, write a letter to the company from whom the parts were purchased, giving an exact list and description of the materials, why you wish to return them, whether for repairs, credit, or replacement, and also the MODEL, SPECIFICATION and SERIAL numbers of the engine from which the parts were taken. If authority is granted for their return, transportation charges must be prepaid and sender's name marked on the outside of the box or package.

PARTS FOR MODEL MVG4D ENGINE

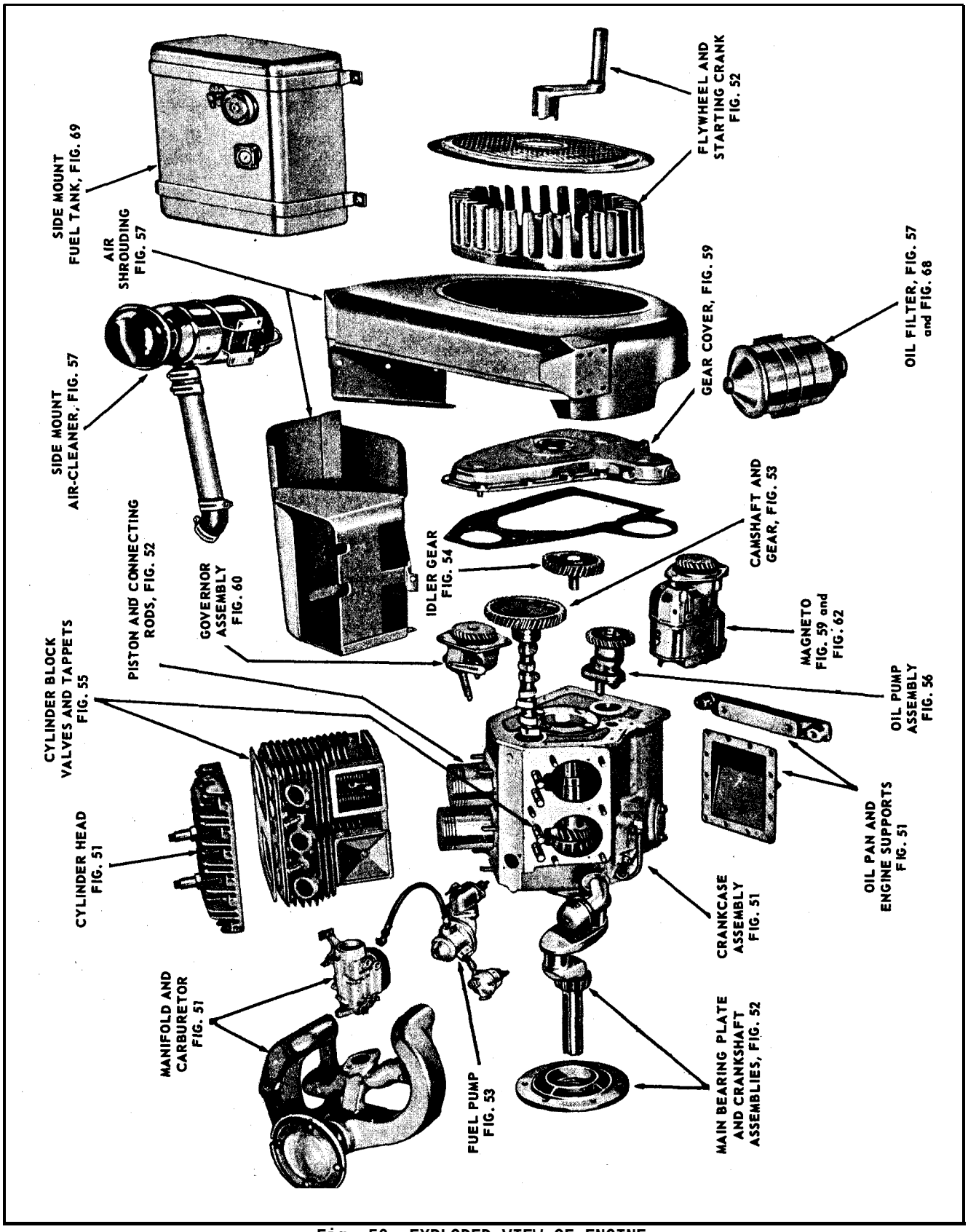
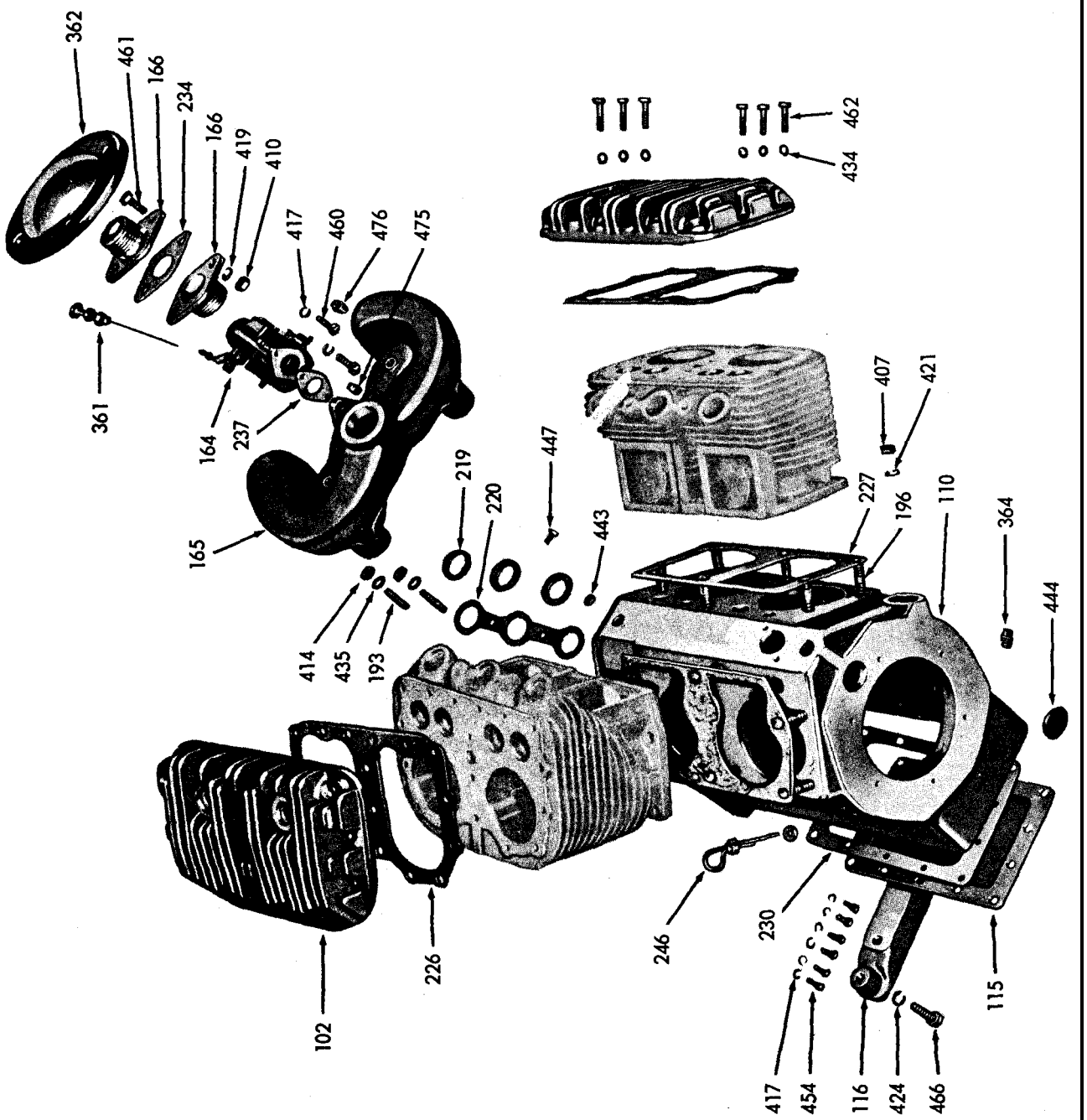


Fig. 50, EXPLODED VIEW OF ENGINE
Refer to figure numbers for break down of parts.



2382491

Fig. 51, MANIFOLD AND CRANKCASE GROUP

Parts are identified by reference number. See parts list for correct part number.

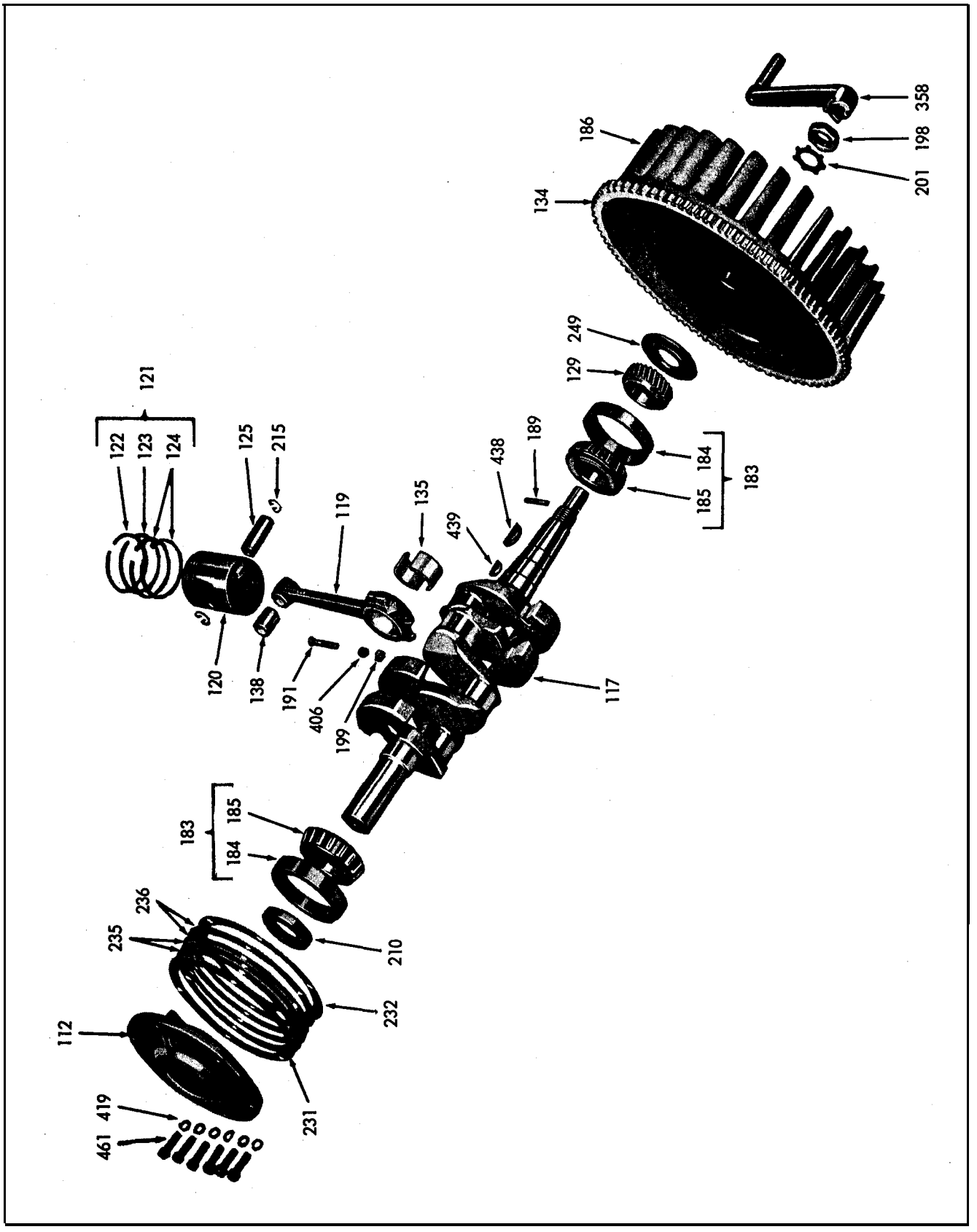


Fig. 52, CRANKSHAFT, PISTON AND CONNECTING ROD GROUP

180189 C-A

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

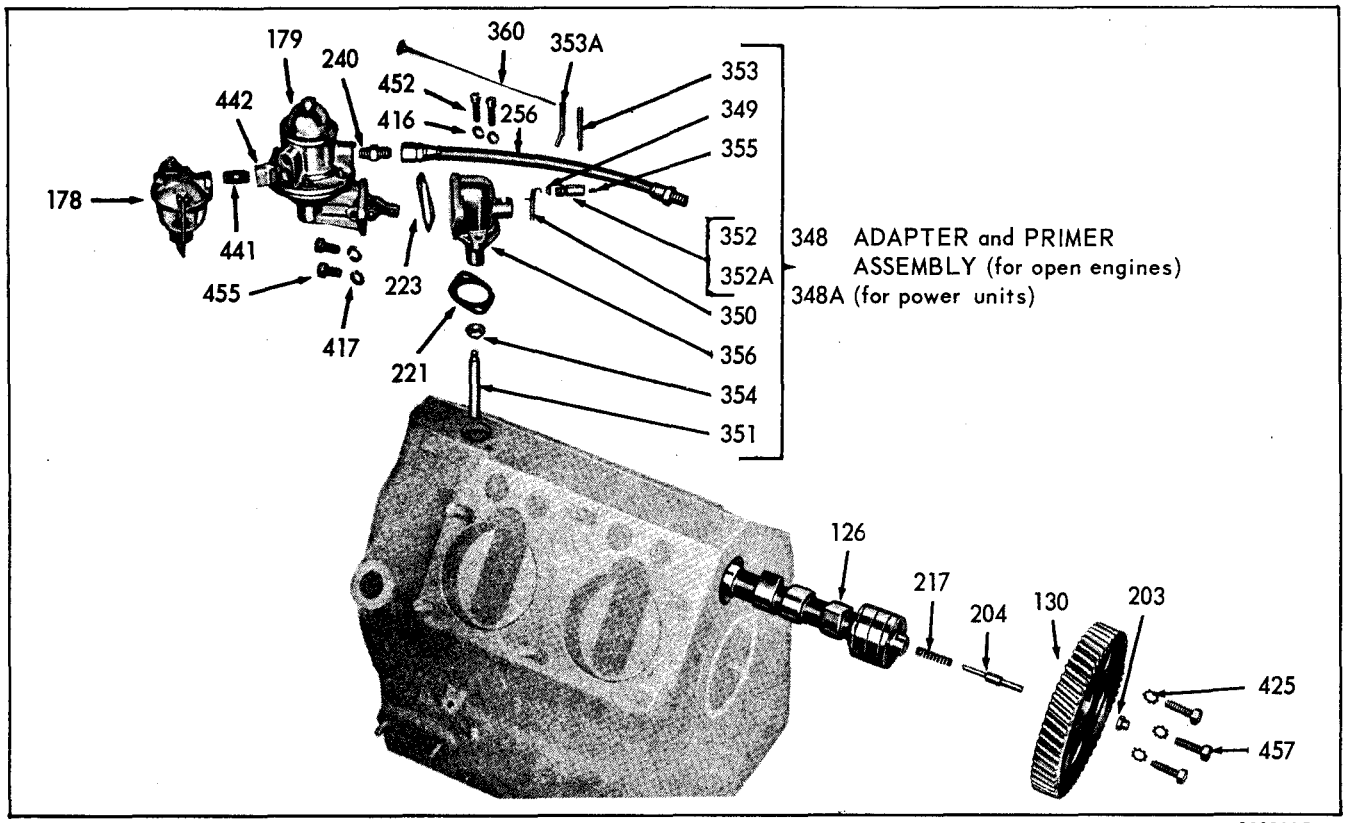
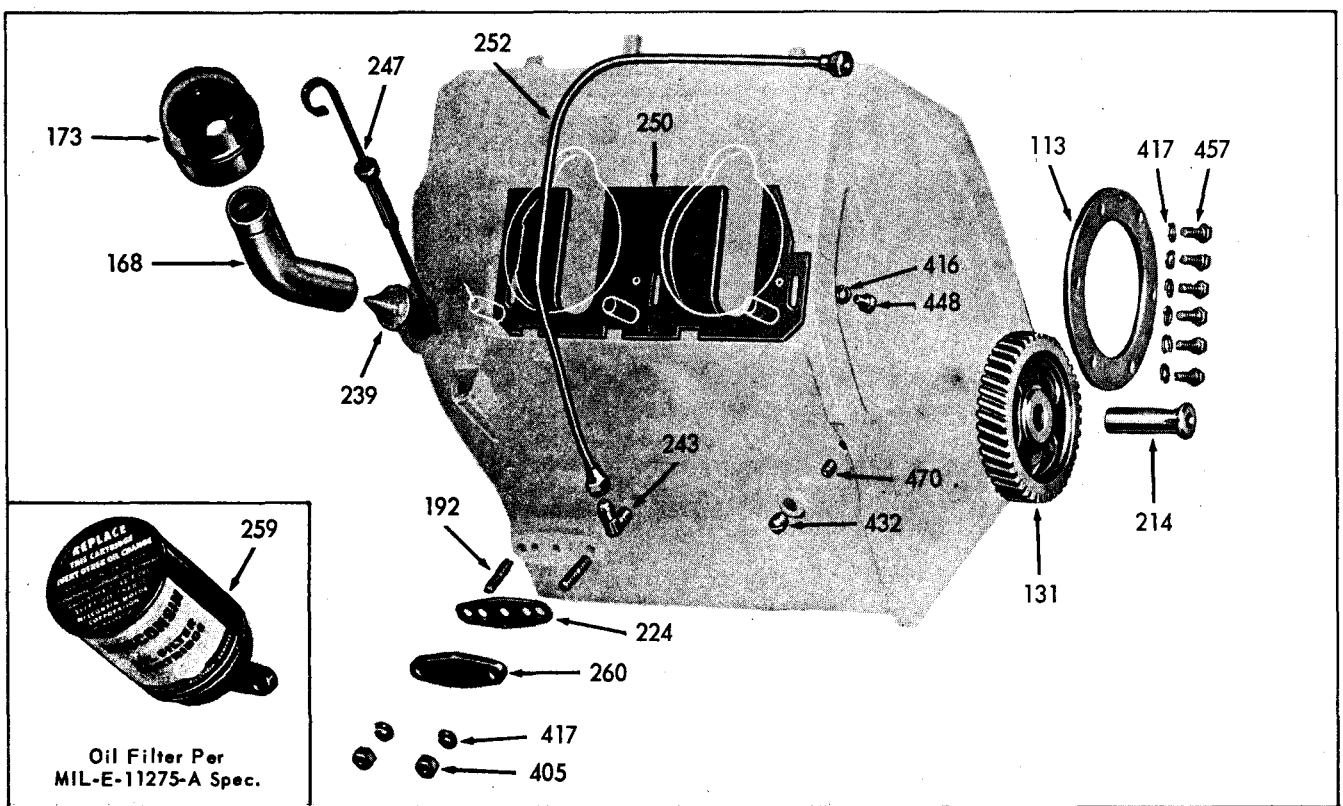


Fig. 53, CAMSHAFT AND FUEL PUMP MOUNTING GROUP

180193C-A1



238250C-1

Fig. 54, IDLER GEAR AND OIL FILLER MOUNTING GROUP

Parts are identified by reference number. See parts list for correct part number.

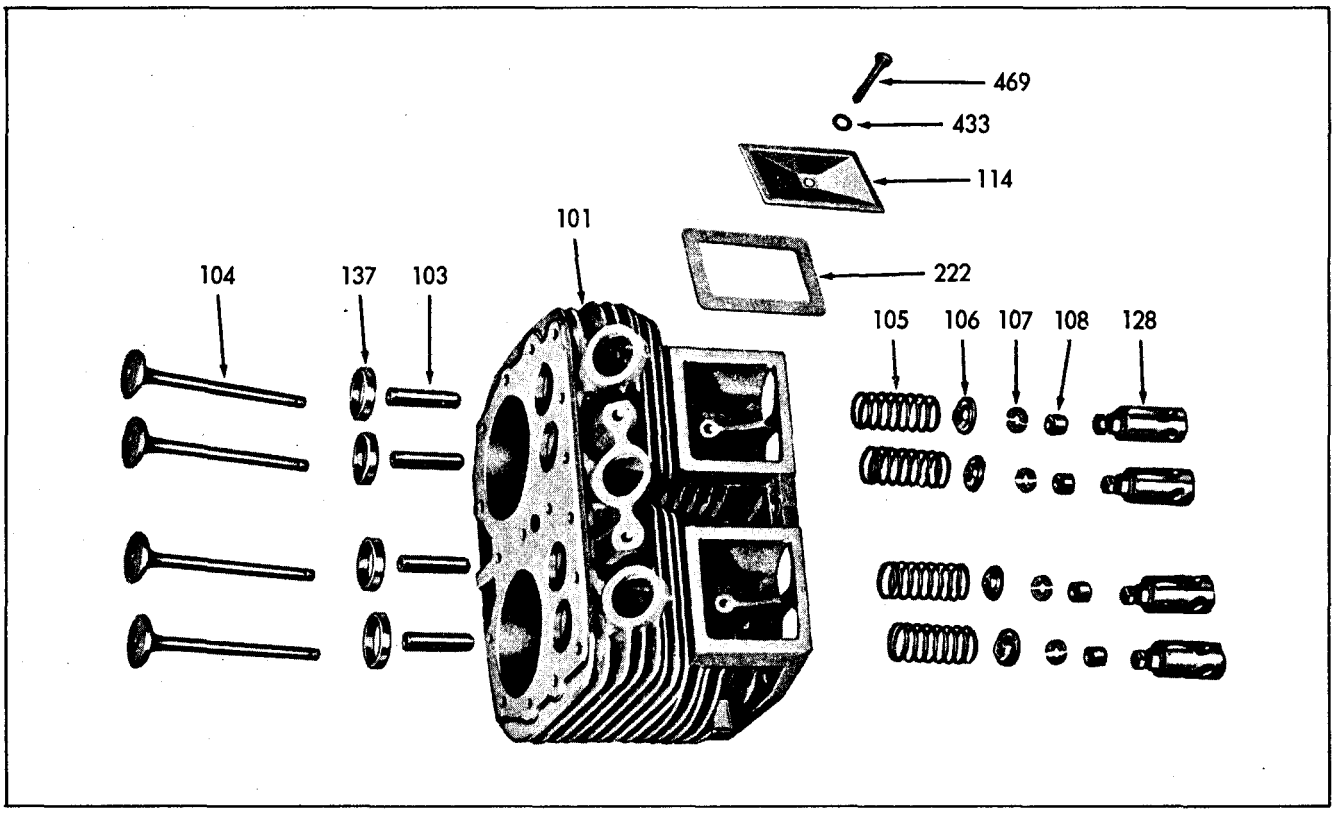


Fig. 55, CYLINDER BLOCK ASSEMBLY

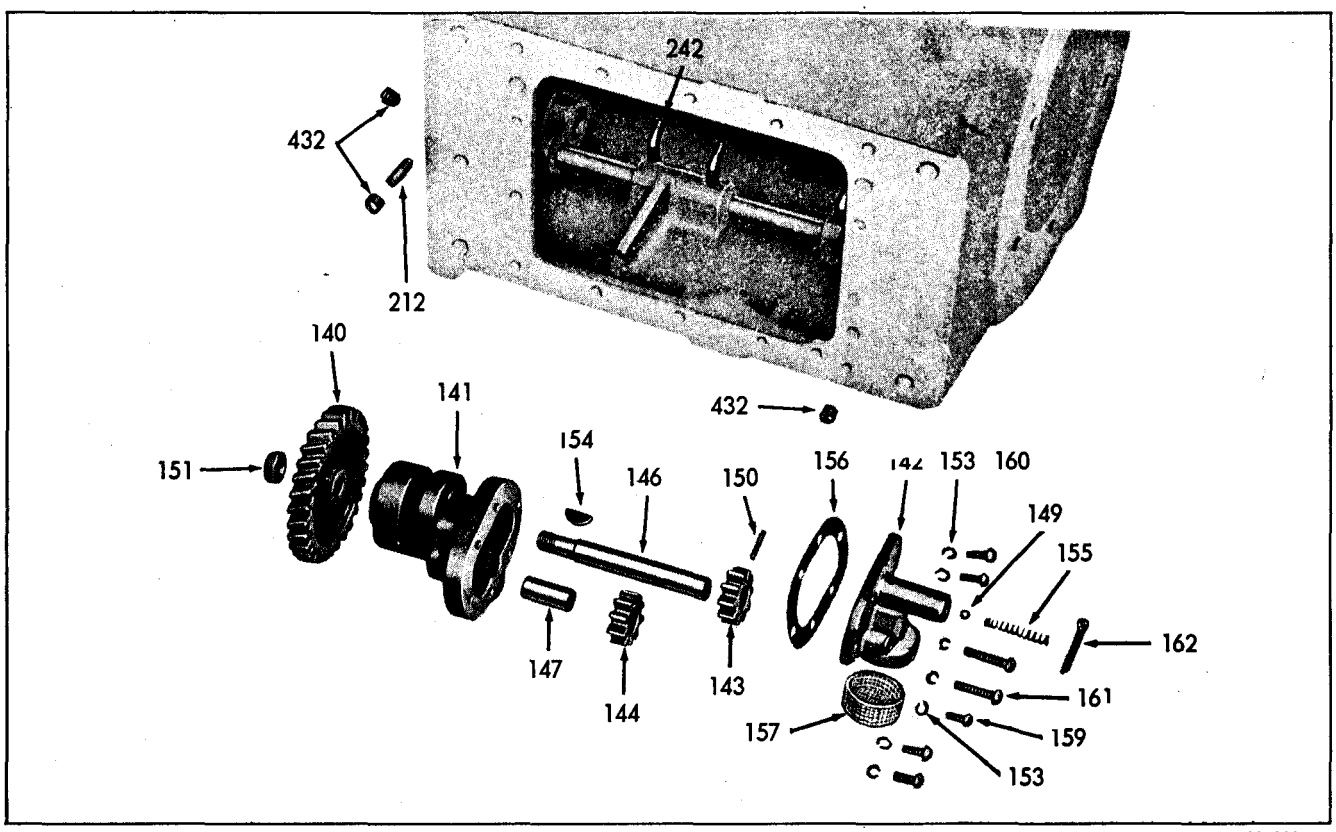


Fig. 56, Ref. No. 139, OIL PUMP ASSEMBLY

129786C-A

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

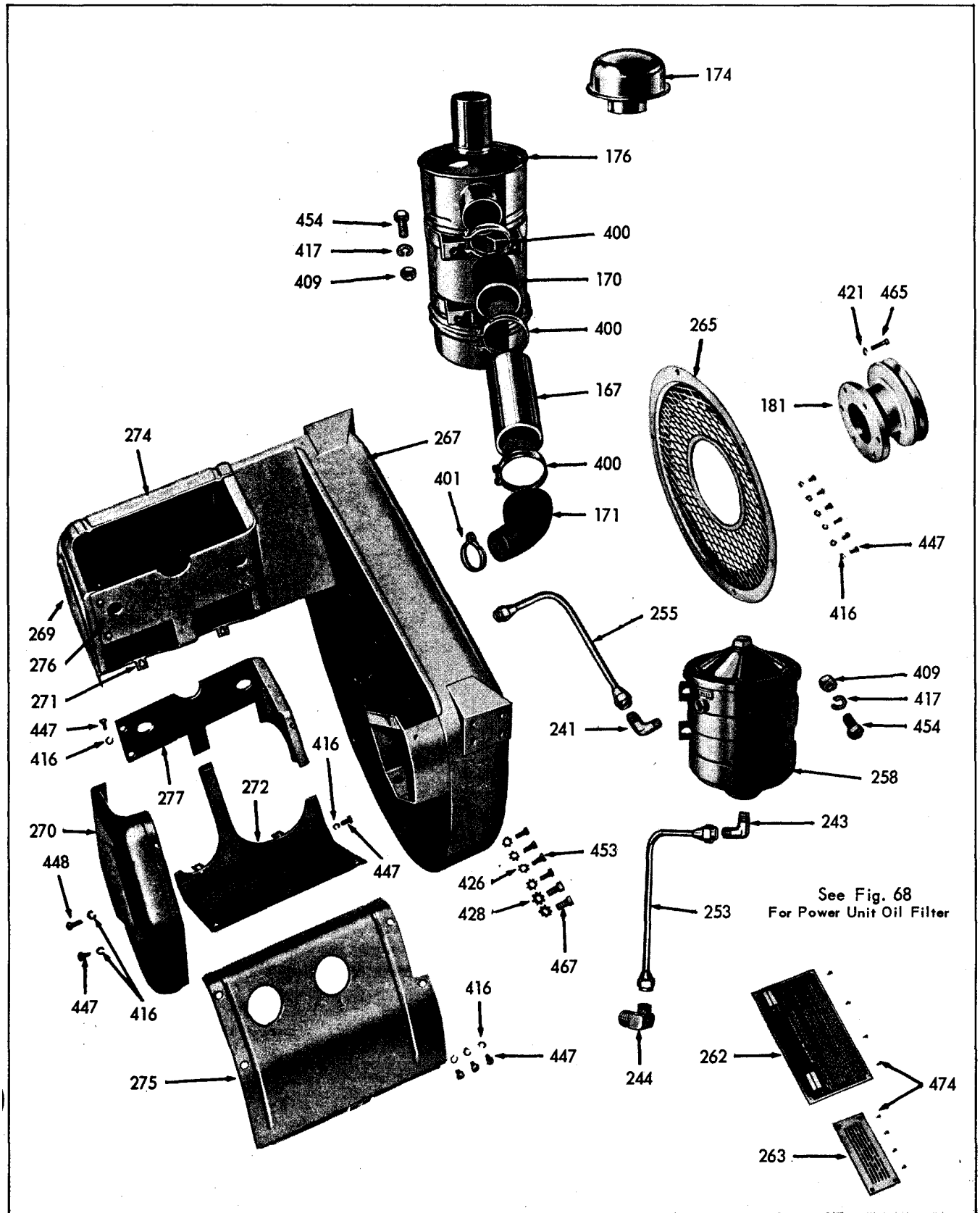
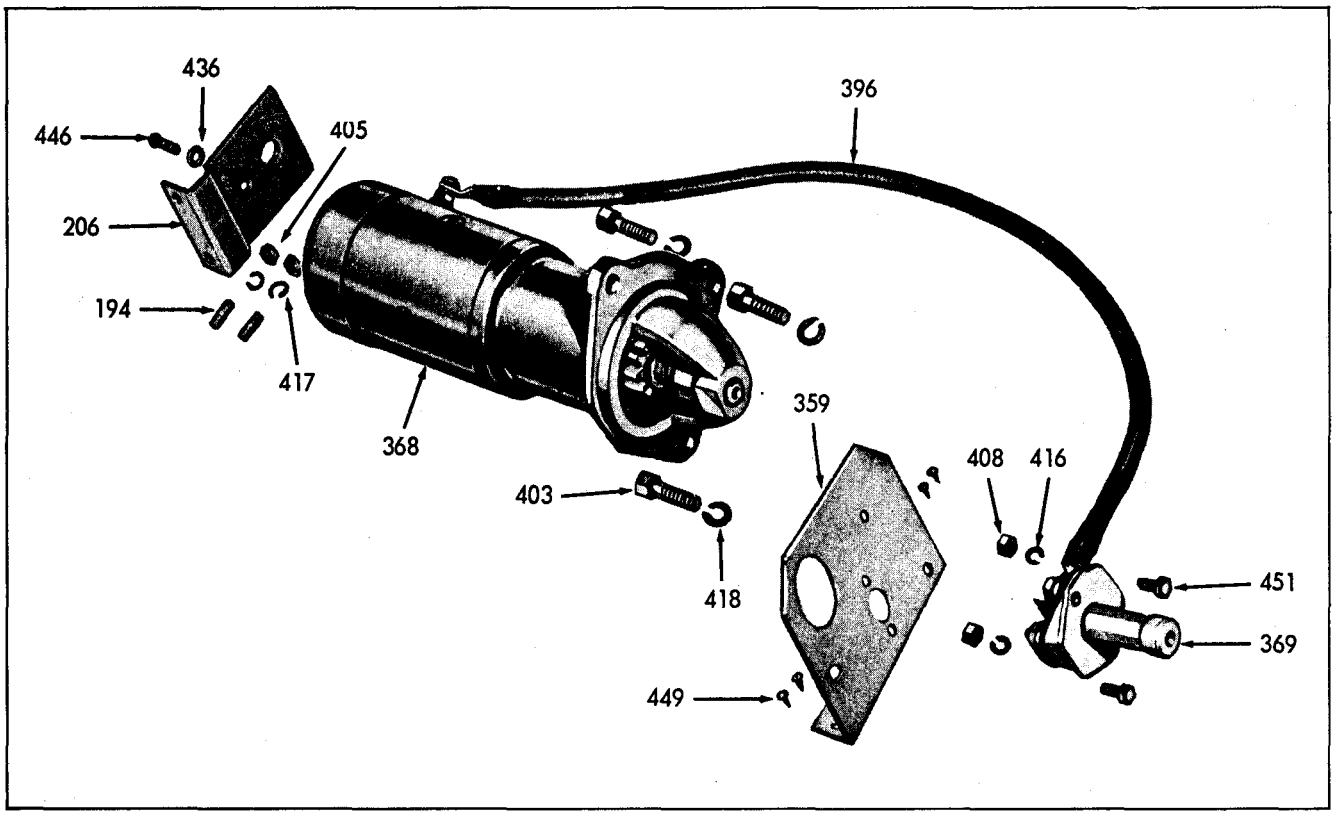


Fig. 57, MILITARY OIL FILTER, AIR SHROUDING AND AIR CLEANER
Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE



Fig, 58, ELECTRIC STARTER MOUNTING GROUP

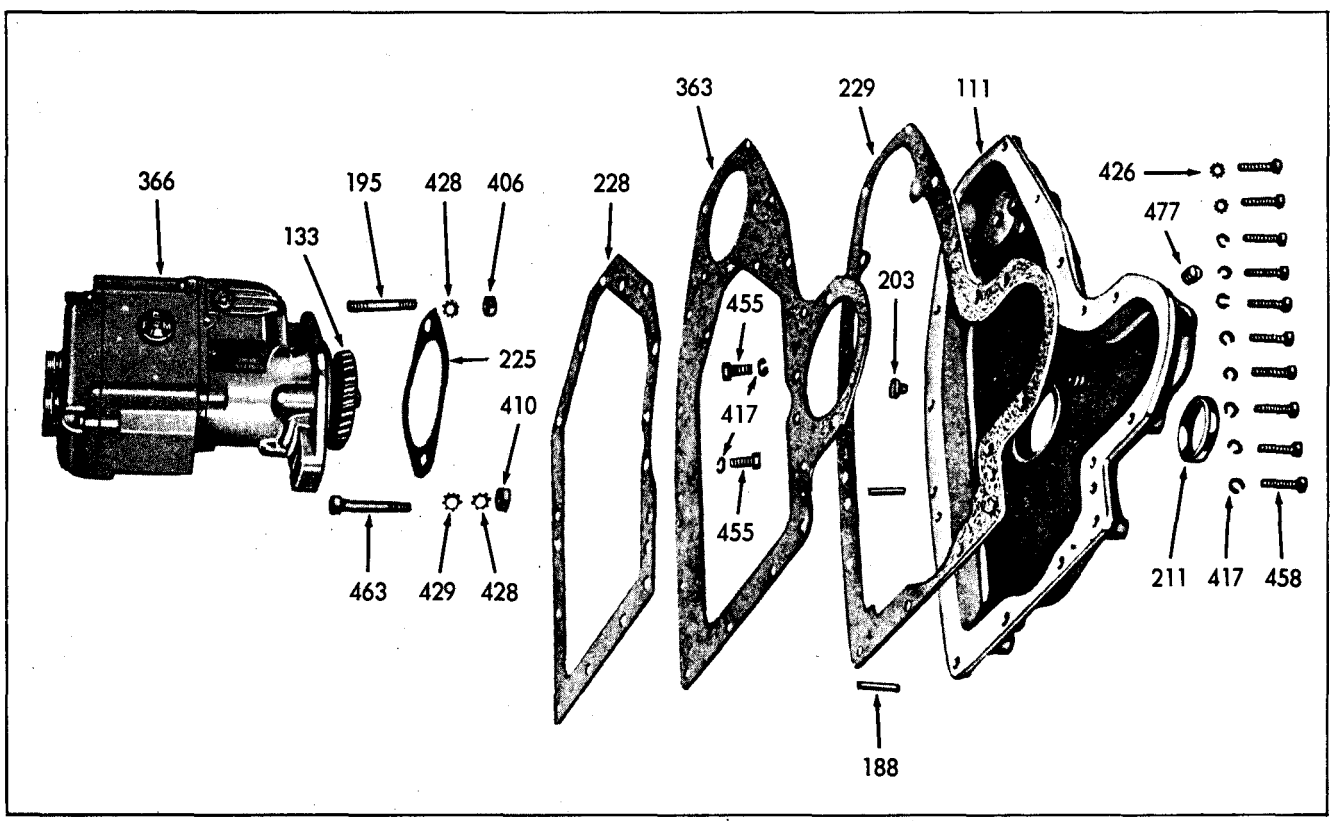
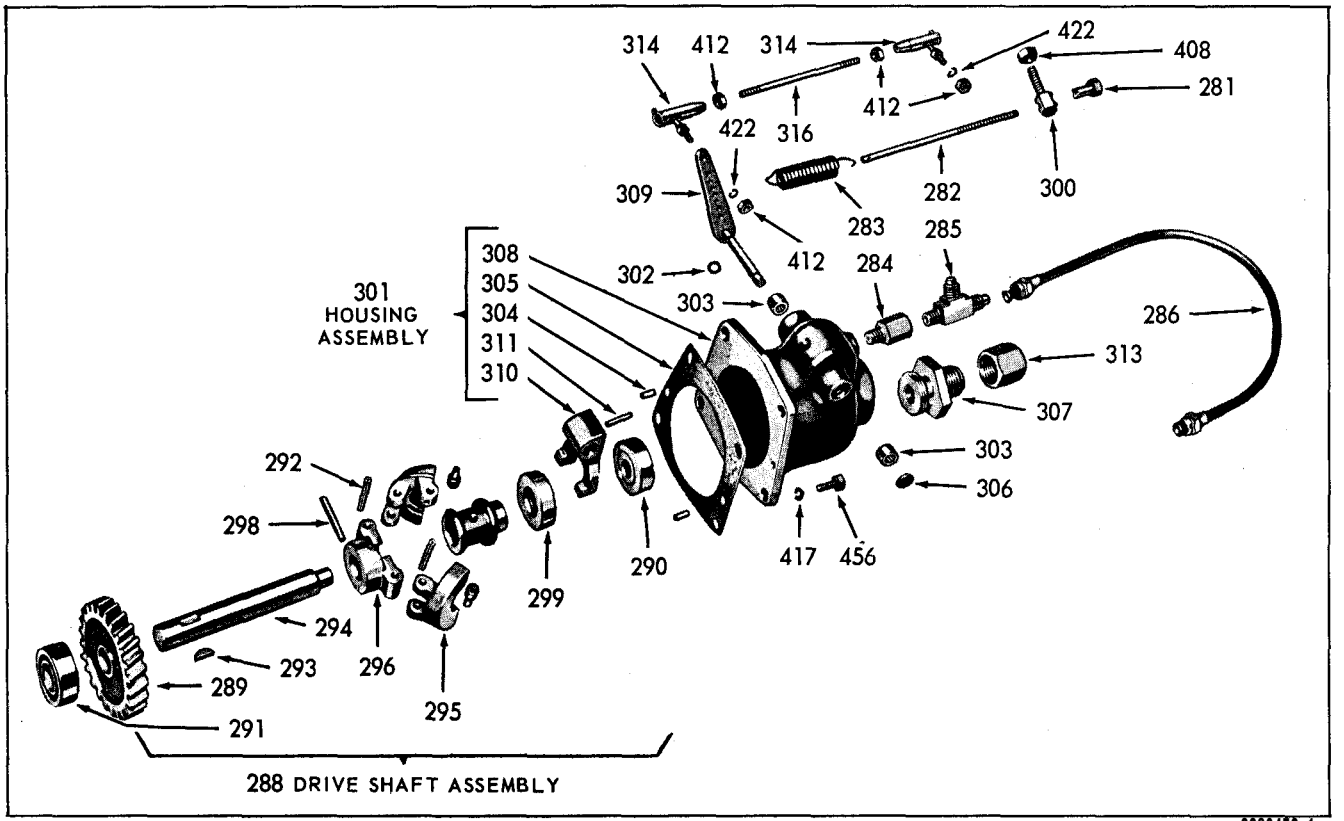


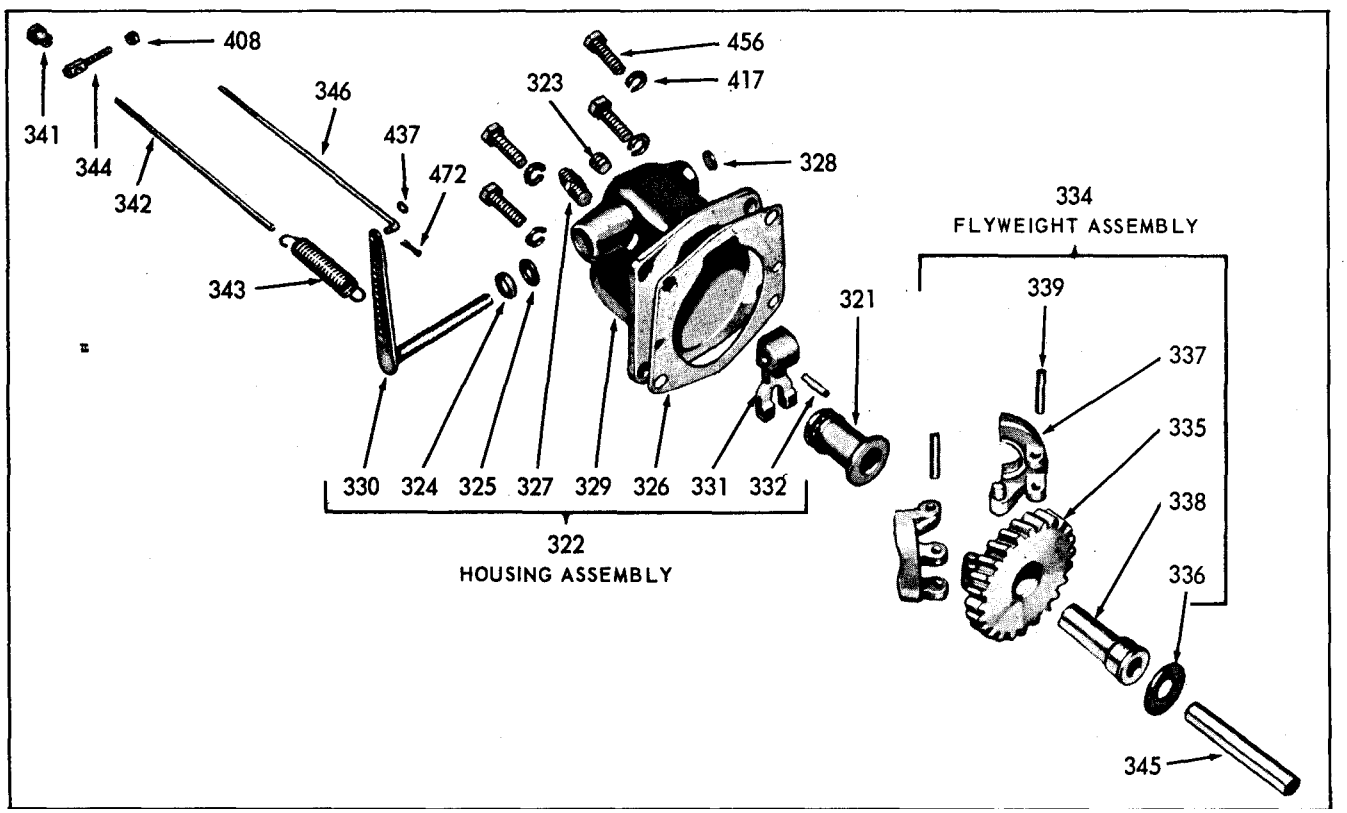
Fig. 59, MAGNETO AND GEAR COVER GROUP
Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE



228045C-1

Fig. 60, Ref. No. 279, GOVERNOR ASSEMBLY FOR MIL-E-11275-C and MIL-E-11275-B ENGINES



129792C-1

Fig. 61, Ref. No. 320, GOVERNOR ASSEMBLY FOR MIL-E-11275-A ENGINES
Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

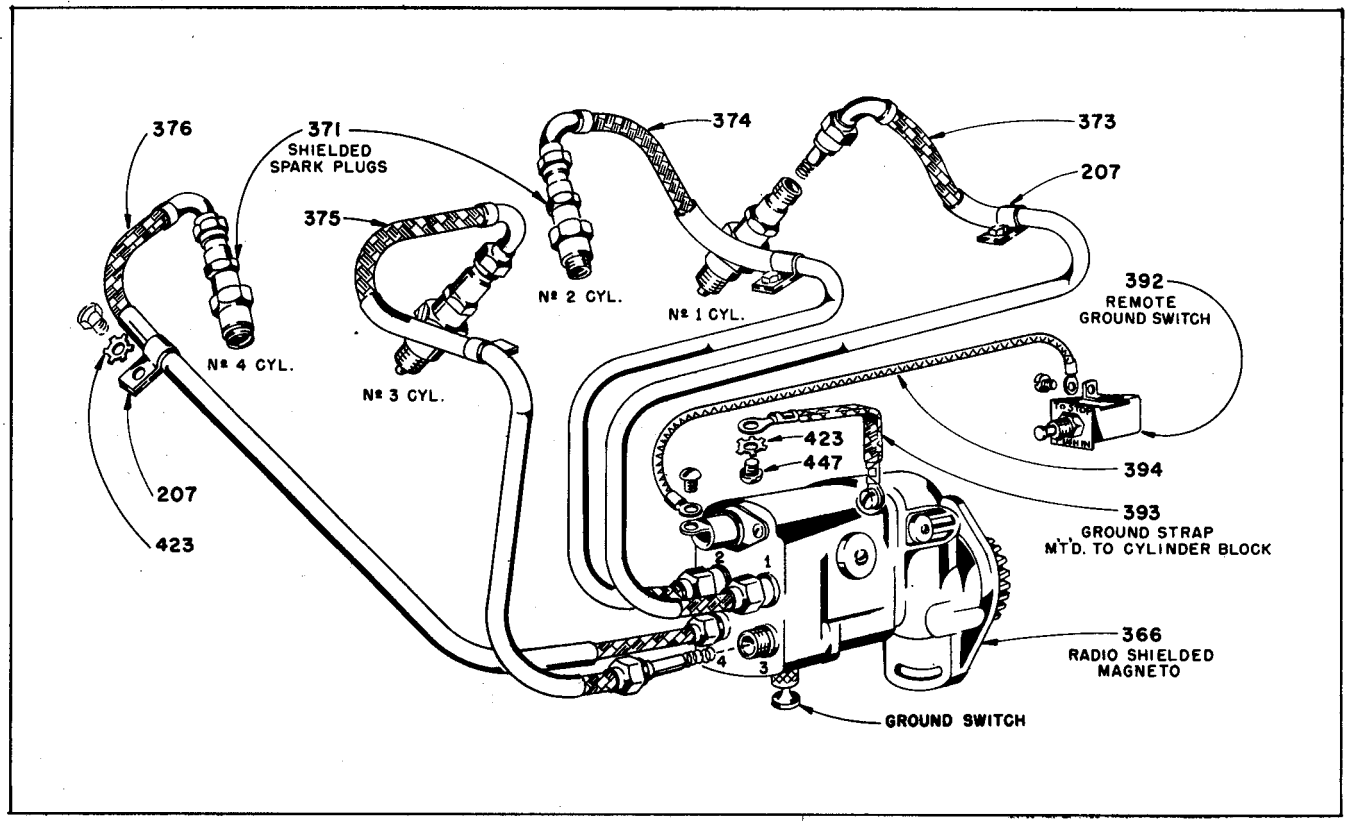


Fig. 62, RADIO SHIELDED MAGNETO IGNITION FOR MIL-E-11275-C ENGINES

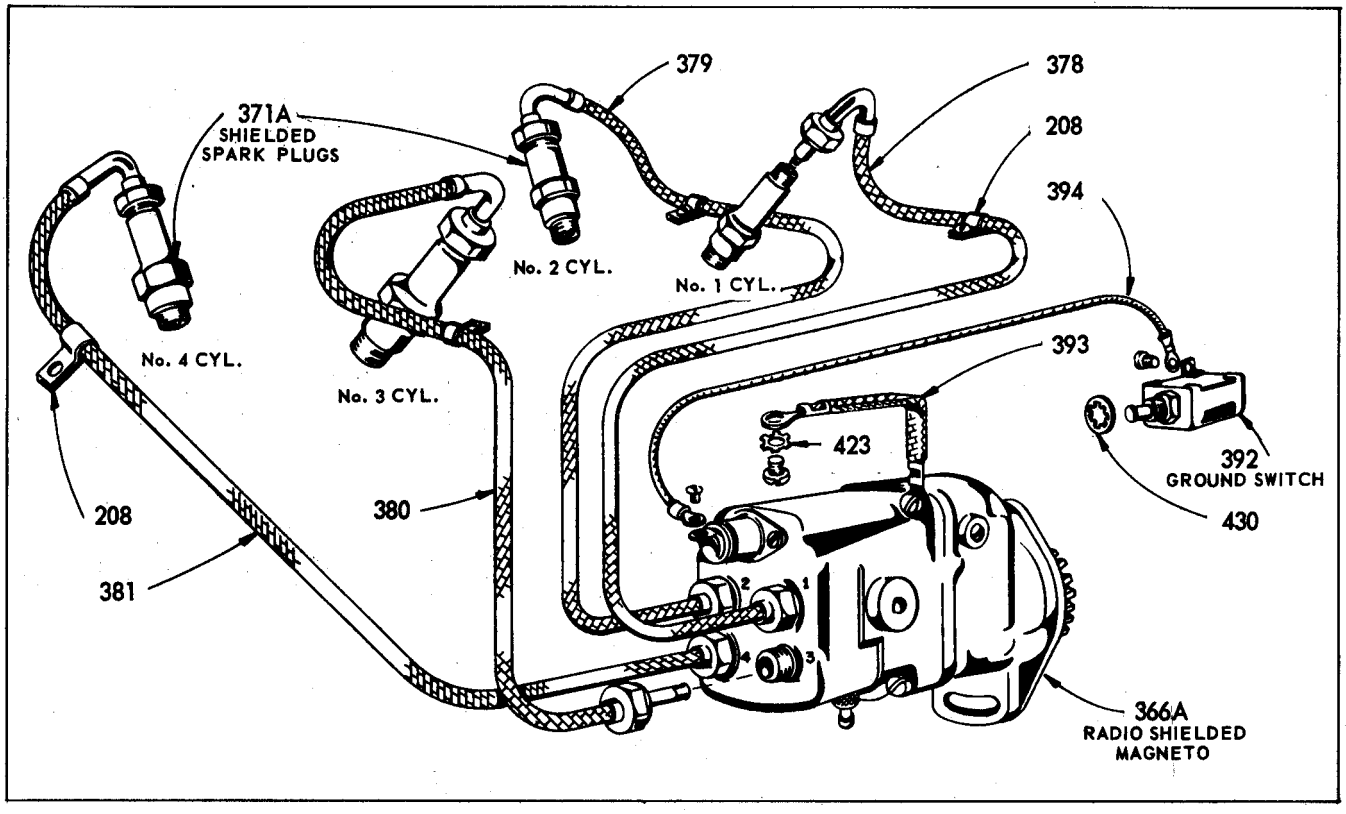


Fig. 62A, RADIO SHIELDED MAGNETO lGNITION FOR MIL-E-11275-B ENGINES
Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

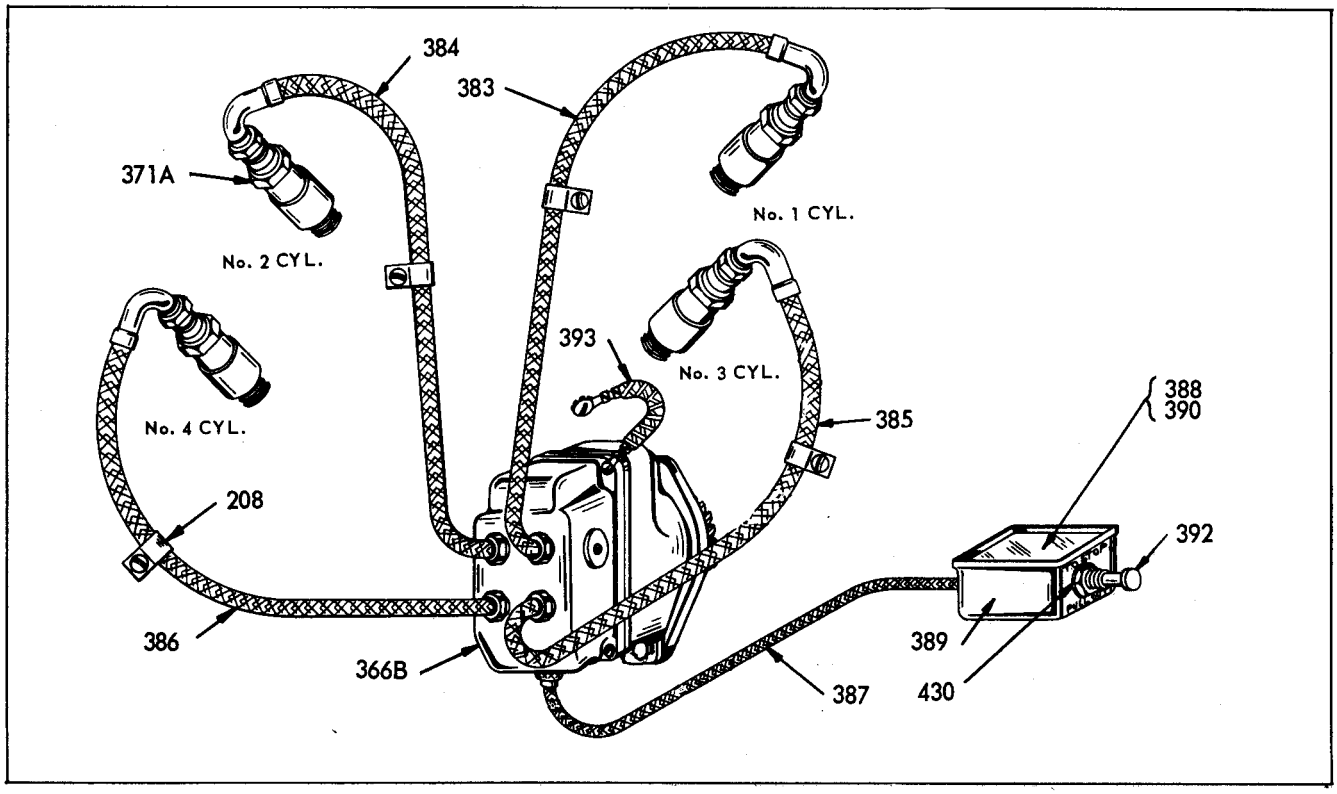


Fig. 62B, RADIO SHIELDED MAGNETO IGNITION FOR MIL-E-11275-A ENGINES

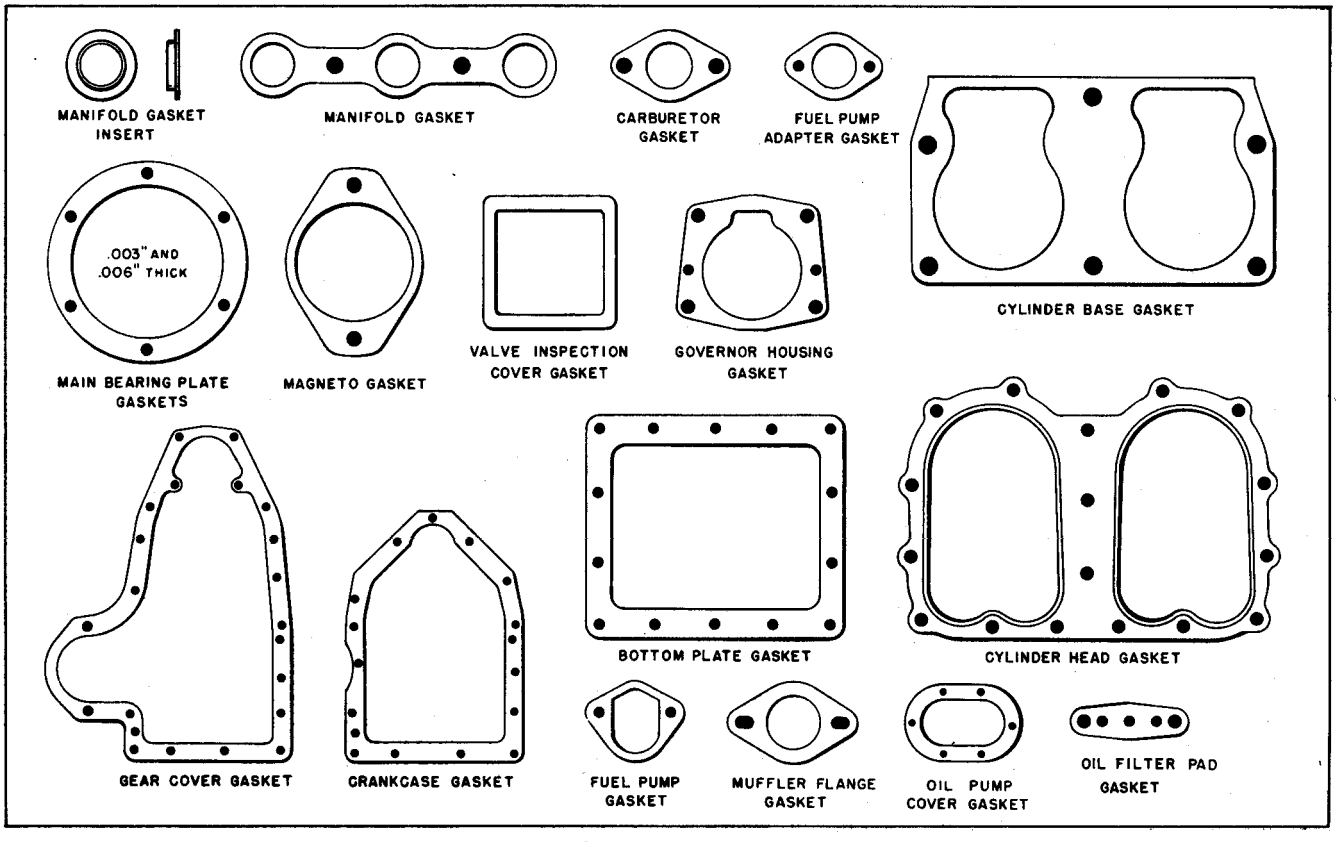


Fig. 63, Ref. No, 218, GASKET SET
Parts are identified by reference number. See parts list for correct part number.

STANDARD ENGINE PARTS LIST
FOR MODEL MVG 4D
PER MILITARY SPECIFICATIONS MIL-E-11275-C, MIL-E-11275-B and MIL-E-11275-A

This list is for a standard engine without house. If power unit house parts are required, refer to Page 45.

THE MS- NUMBERS IMMEDIATELY BELOW THE BOLD PART NUMBERS ARE MILITARY STANDARD NUMBERS FOR THE CORRESPONDING PART. THESE ARE INTERCHANGEABLE HIGH MORTALITY PARTS.

NOTE: Parts are interchangeable for these models of engines, except where noted by the Military Specification Numbers, MIL-E-11275-C, MIL-E-11275-B or MIL-E-11275-A.

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
101	AA-90A-2-S1	**CYLINDER BLOCK ASSEMBLY** ..... Complete — consisting of: 1 AA-90A-2 Cylinder block; 4 AD-42-A Valve stem guide; 4 AE-84-D Valves; 4 AF-49A Valve springs; 4 AG-30 Spring Seats; 4 AH-14 Retainer locks; 4 AH-15 Valve stem rotator caps; 2 BH-103 Valve inspection cover; 4 HG-150-D Valve seat inserts; 2 PC-251 Studs; 2 PH-14 Washers; 2 QD-482 Gaskets; 2 XD-148 Screws	2	44	
102	AB-97B-2-S1	**CYLINDER HEAD** with plug inserts ..... AB-97A-S1 (MIL-E-11275-A) with heli-coil inserts, replaced by AB-97B-2-S1.	2	6	2
103	AD-42-A	**VALVE STEM GUIDE,** inlet and exhaust	8		2
104	AE-84-D MS-13999-8	**VALVE, STELLITE**	8		4
105	AF-49-A	**VALVE SPRING,** 2.312" free length	8		2
106	AG-30	**VALVE SPRING SEAT**	8		1
107	AH-14 MS-13997-1	**LOCK** for valve spring seat	8 pr		1
108	AH-15 MS-13998-1	**ROTATOR CAPS** for valve stems	8		1
110	See Fig. A	**CRANKCASE ASSEMBLY** ..... Consisting of: 1 Crankcase; 1 LJ-300-M Tube; 1 RC-91 Screen; 2 PC-111 Studs; 4 RF-1121 Nozzles; 2 PC-112 Studs; 1 RJ-159 Saber; 2 PC-396 Studs; 1 RJ-159-A Saber; 12 PC-435 Studs; 2 SA-26 Plugs; 8 PF-18 Plugs; 1 SA-58 Plug	1	68	

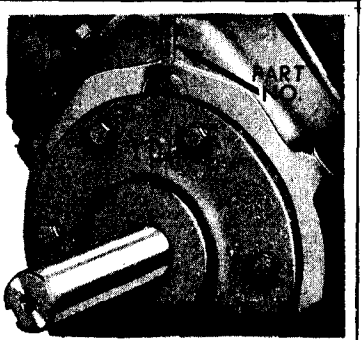


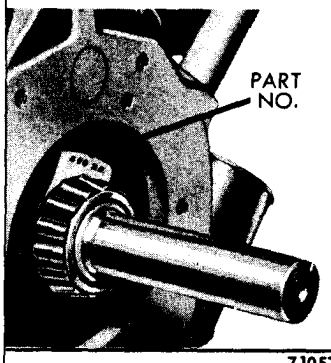
Fig. A 76638C

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		NOTE: The basic standard crankcase part number is **BA-49-A.** Any special machining is indicated by a number stamped on the crankcase in the location shown in **FIG. A.** Add this number to **BA-49-A.** Order by complete number and by giving the Model, Specification and Serial Numbers of the engine.			
111	BD-101-1-S1	**GEAR COVER ASSEMBLY** for engines built to **MIL-E-11275-C, MIL-E-11275-B** specs. ..... Consisting of: 1 BD-101-1 Cover; 1 PF-52 Button; 1 PH-269 Oil seal; 1 SA-10 Plug; 1 XK-3 Plug	1	15	
	BD-101-S1	For engines built to **MIL-E-11275-A** specification..... Consisting of: 1 BD-101 Gear cover; 1 PF-52 Button; 1 PH-269 Seal; 1 TC-388-1 Shaft; 1 XK-3 Plug		15	6
112	BG-193A-S2	**MAIN BEARING PLATE ASSEMBLY** .. Take-off end — consisting of: 1 BG-193-A Bearing plate; 1 ME-98-1 Bearing cup; 1 PH-202 Oil seal **NOTE:** Engines equipped with a clutch, or clutch reduction unit, require a special main bearing plate as specified in the rear section of this manual where these accessories are located.	1	6	
113	BG-223	**BEARING RETAINER PLATE** ..... Flywheel end.	1		10
114	BH-103	**VALVE TAPPET INSPECTION COVER**	4		4
115	BH-155-C	**CRANKCASE BOTTOM COVER** ..... For engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec.	1	2	
	BH-155-A	For **MIL-E-11275-A** Spec. engines		2	
116	BK-72-A	**ENGINE SUPPORT,** 1-5/8" high, (cast iron) for engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec.	2	6	
	BK-72	1-1/2" high, for engines built to **MIL-E-11275-A** Spec.		5	10
117	See Fig. B	**CRANKSHAFT ASSEMBLY** ..... Consisting of: 1 Crankshaft; 1 GA-35A-1 Gear; 1 PL-49 Key; 2 ME-98 Br'gs.; 1 RK-173 Sling **NOTE:** The part number of the crankshaft will be found stamped on the cheek facing the take-off end of the shaft as illustrated in **FIG. B. ORDER BY THIS NUMBER** and by giving the Model, Specification and Serial Number of the engine.	1	53	

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		 Fig. B 71057C			
119	DA-66A-4-S1	**CONNECTING ROD ASSEMBLY** ..... Consisting of: 1 DA-66A-4 Rod (Not serviced separately) 2 HA-120 Shell bearings 1 HG-221 Bushing 2 PB-146-1 Bolts 2 PD-11 Nuts 2 PD-182 Palnuts	4	3	8
120	DB-213-SP MS-13957-1	**PISTON ASSEMBLY,** standard size	4	1	3
	DB-213-SP-20 MS-13957-2	**PISTON ASSEMBLY,** .020" oversize			
	DB-213-SP-40 MS-13957-3	**PISTON ASSEMBLY,** .040" oversize			
		NOTE: Piston assembly consists of piston pin and retainers.			
121	DR-25	**PISTON RING SET,** standard size	1		10
	DR-25-S20	**PISTON RING SET,** .020" oversize			
	DR-25-S40	**PISTON RING SET,** .040" oversize			
122	DC-170 MS-13933-7	**COMPRESSION RING,** standard size .... No. 1 groove.	4		1
	DC-170-S20 MS-13933-8	**COMPRESSION RING,** .020" oversize ..			
	DC-170-S40 MS-13933-9	**COMPRESSION RING,** .040" oversize .			
123	DC-171 MS-13932-7	**COMPRESSION RING,** standard size .... No. 2 groove.	4		1
	DC-171-S20 MS-13932-8	**COMPRESSION RING,** .020" oversize ..			
	DC-171-S40 MS-13932-9	**COMPRESSION RING,** .040" oversize ..			
124	DC-172 MS-13931-10	**OIL RING,** standard size ..... No. 3 and 4 groove.	8		1
	DC-172-S20 MS-13931-11	**OIL RING,** .020" oversize			
	DC-172-S40 MS-13931-12	**OIL RING,** .040" oversize			
125	DE-71 MS-13996-2	**PISTON PIN**	4		3
126	EA-112	**CAMSHAFT**	1	4	

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
128	F-65	**VALVE TAPPET** with PB-169A lock-screw	8		4
129	GA-35A-1	**CRANKSHAFT GEAR**	1	1	
130	GB-46	**CAMSHAFT GEAR**	1	2	14
131	GC-28	**IDLER GEAR**	1	2	1
133	GD-103-1	**MAGNETO GEAR**	1		13
134	GH-43	**RING GEAR,** flywheel starter	1	2	
135	HA-120 MS-13993-1	**CONNECTING ROD SHELL BEARINGS**	8		2
137	HG-150-D	**VALVE SEAT INSERT,** Stellite	8		1
138	HG-221 MS-13963-1	**PISTON PIN BUSHING**	4		1
139	K-95-L	**OIL PUMP ASSEMBLY,** complete (Fig. 56) ..... K-95-D, replaced by K-95-L. **NOTE:** Beginning with Serial No. 3795557, the K-95-L oil pump replaces K-95-D and utilizes the same internal gears for both the drive and driven gears. Therefore, driven gear and stub shaft for old pumps are not interchangeable since gear bore diameters are not the same.	1	3	13
		Pump assembly consists of:			
140		**GD-94-C** Oil Pump Drive Gear (external)	1		11
141		**KA-61-C-S1** Body — Includes: KC-56A Gear KD-122A Shaft KA-61A-1-S1, replaced by KA-61C-S1.	1	2	
142		**KB-42-S2** Cover Assembly, includes relief valve and screen	1		11
143		**KC-56-A** Driver Gear ..... KC-56-1, replaced by KC-56-A.	1		1
144		**KC-56-A** Driven Gear, .499—.498 I.D. beginning with Serial No. 3795557. .... KC-56-2 (K-95D pump) .5015—.5005 I.D. previous to Serial No. 3795557. For replacement use KC-56A-1.	1		1
146		**KD-121-S1** Drive Shaft with KC-56-A gear	1		4
147		**KD-122-A** Stub Shaft, for engines beginning with Serial No. 3795557 ..... KD-122 (K-95D pump) previous to engine No. 3795557, no longer available, order KA-61C-S1 Body Assembly.	1		2
149		**ME-60** Check Ball, 1/4" dia. steel	1		1
150		**PA-64** Pin, 1/8" dia. x 3/4" long steel straight, for driver gear	1		1
151		**PD-195** Jam Lock-Nut, 7/16"-20 thread For gear mounting.	1		1
153		**PE-14** Lockwasher, No. 10 Positive .... 6-for cover 1-for screen	7		1
154		**PL-137** Key, No. 1 Woodruff ..... For drive gear.	1		1
155		**PM-111** Spring for relief valve	1		1
156		**QD-535** Cover gasket	1		1
† 157		**RD-112** Screen	1		1
† 159		**XA-7** Screw for screen, No. 10-32 thread x 3/8" long steel round head	1		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
160		**XA-8** Screw for cover, No. 10-32 thread x 1/2" long steel round head	4		1
161		**XA-56** Screw for cover, No. 10-32 thread x 1-1/4" long steel round head	2		1
162		**XI-16** Cotter Pin for valve, 1/8" x 1"	1		1
164	**L-54J-3-S1**	**CARBURETOR** with gasket (for **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines same as Marvel-Schebler VH-69 (Wis. Motor No. L-54-J-1) but with swivel block removed from throttle lever for ball joint.			
	Optional **L-57-2-S1**	**CARBURETOR,** same as Zenith Model 87A8, No. O-11532 (Wis. Motor No. L-57-1) but with swivel block removed from throttle lever for ball joint. **L-54J-1-S1** or **L-57-1-S1** for **MIL-E-11275-A** engines.			
		NOTE: Refer to L-54J-1 or L-57-1 bulletins in rear of manual for service parts lists.			
165	**LD-240-19-S1**	**INLET** and **EXHAUST MANIFOLD** ..... With plugs.	1	19	
166	**LF-131**	**FLANGED MUFFLER ADAPTER** (male) Refer to Fig. 65 for female adapter.	2	1	
167	**LJ-131-3**	**TUBE** for air cleaner connection on **MIL-E-11275-C** Spec engines	1		6
168	**LJ-300-M**	**OIL FILLER TUBE**	1		12
170	**LL-18**	**RUBBER HOSE** for air cleaner on **MIL-E-11275-C** Spec engines	1		3
171	**LL-89-2**	**RUBBER ELBOW** for air cleaner on **MIL-E-11275-C** Spec engines	1		6
173	**LO-60-1**	**CAP** for oil filler and breather	1		6
174	**LO-62**	**AIR STACK CAP**	1	1	
176	**LO-138-S1** **MS-35875-3**	**AIR CLEANER** (6" dia.) Donaldson Co. No. **KAX00-0354** or-0405 for engines built to **MIL-E-11275-C** spec. For MIL-E-11275-B and MIL-E-11275-A spec engines, refer to Page **53,** Fig. 70. Service parts: Donaldson part numbers.	1	6	
		— — — — Body assembly — not serviced separately, order complete air cleaner.			
		P10-1362 Oil cup clamp assembly	1		3
		P10-1360 Oil cup assembly (inner)	1		6
		P10-1361 Cup gasket	1		1
		P-17703 Oil cup (outer)	1		10
		AAH00-0343 Mounting band assembly	2		6
178	**LP-19** **MS-51086**	**FUEL STRAINER,** Tillotson **OW-418-T** **NOTE:** See illustration in accessory section of manual for service parts list of fuel strainer.	1		6
179	**LP-38-C** **LQ-30-A**	**FUEL PUMP** **REPAIR KIT** for fuel pump **NOTE:** Refer to fuel pump instruction sheet in back of manual for maintenance and repair. LQ-21-E, replaced by LQ-30-A.	1 1	1	11 3
181	**MD-285-1**	**GENERATOR DRIVE SHEAVE**	1	5	13
183	**ME-98**	**MAIN BEARING ASSEMBLY** Consisting of:	2	2	11
184		**ME-98-1** Cup	1		15
185		**ME-98-2** Cone	1	1	12
186	**NC-146C-2-S1**	**FLYWHEEL,** Standard Consisting of: 1 GH-43 Ring gear 1 NC-146C-2 Flywheel	1	46	
188	**PA-291**	**DOWEL PIN** for gear cover to case	2		1
189	**PA-334**	**PIN** in crankshaft for hand crank	1		1
191	**PB-146-1-S1**	**CONNECTING ROD BOLT ASSEMBLY** Consisting of: 1 PB-146-1 Bolt 1 PD-11 Nut 1 PD-182 Palnut	8		2
192	**PC-112**	**STUD** for oil filter or pad cover	2		1
193	**PC-251**	**STUD** for mounting manifold to cylinder block	4		1
194	**PC-396**	**STUD** for mounting starter bracket	2		1
195	**PC-429**	**STUD** for mounting magneto (upper hole)	1		2
196	**PC-435**	**STUD** for mounting cyl. block to case	12		2
198	**PD-157**	**NUT** for mounting flywheel	1		2
199	**PD-182**	**PALNUT** for connecting rod bolts, 3/8"-24	8		1
201	**PE-65-1**	**STAR LOCKWASHER** For mounting flywheel.	1		1
203	**PF-52**	**CAMSHAFT THRUST PLUNGER BUTTON**	1		1
204	**PF-101**	**CAMSHAFT THRUST PLUNGER**	1		1
206	**PG-515-A**	**STARTER SUPPORT BRACKET**	1		4
207	**PG-558**	**CLIP** (1/2" I.D.) for shielded cable, on **MIL-E-11275-C** Spec engines	4		1
208	**PG-630**	**CLIP** (3/8" I.D.) for shielded cable, on **MIL-E-11275-B, MIL-E-11275-A** engines	4		1
210	**PH-202**	**MAIN BEARING OIL SEAL,** take-off end	1		3
211	**PH-269**	**MAIN BEARING OIL SEAL** flywheel end	1		2
212	**PI.143-B**	**OIL PUMP LOCKSCREW**	1		1
214	**PJ-105**	**STUD** for idler gear	1		5
215	**PK-106** **MS-13962-1**	**RETAINING RING** for piston pin	8		1
217	**PM-108**	**SPRING** for camshaft thrust plunger	1		1
218	**Q-18-B**	**GASKET SET** (Fig. 63) Consisting of: 6 QB-83 1 QD-595-A 1 QD-634 2 QC-62 1 QD-615-A 1 QD-635 1 QD-67 1 QD-616 2 QD-636-A 4 QD-482 2 QD-631 1 QD-636-B 1 QD-535 2 QD-632 1 QD-727 1 QD-538-A 1 QD-633 1 QF-91 Q-18-A, replaced by Q-18-B.	1		1
	Q-27	**VALVE GRINDING GASKET SET** Consisting of: 2 QB-83 2 QD-631 2 QC-62 4 QD-482	1		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
219	QB-83	**INSERT** for manifold gasket	6		1
220	QC-62	**GASKET** for manifold to cylinder block	2		1
221	QD-67	**GASKET** for fuel pump adapter	1		1
222	QD-482	**GASKET** for valve inspection cover	4		1
223	QD-538-A	**GASKET** for mounting fuel pump	1		1
224	QD-595-A	**GASKET** for oil filter or pad cover	1		1
225	QD-616	**GASKET** for mounting magneto	1		1
226	QD-631	**GASKET** for cylinder head	2		1
227	QD-632	**GASKET** for cylinder base	2		1
228	QD-633	**GASKET** for crankcase to spacer	1		1
229	QD-634	**GASKET** for gear cover	1		1
230	QD-635	**GASKET** for crankcase bottom cover	1		1
231	QD-636-A	**GASKET** for bearing plate—take-off end, .003" thick	2		1
232	QD-636-B	**GASKET** for bearing plate—take-off end, .006" thick	1		1
234	QD-727	**GASKET** for muffler adapter flange	1		1
235	QF-67-B	**SHIM** for bearing plate—take-off end, .006" thick	2		1
236	QF-67-C	**SHIM** for bearing plate—take-off end, .014" thick	3		1
237	QF-91	**SPACER GASKET** for carburetor	1		2
239	RC-91	**OIL FILLER SCREEN**	1		1
240	RF-269	**STRAIGHT FITTING** for fuel pump outlet	1		1
241	RF-270-4	**RESTRICTED ELBOW** for military oil filter inlet	1		1
242	RF-1121	**OIL SPRAY NOZZLE**	4		1
243	RF-1225	**ELBOW** for fuel line 1-for oil filter drain line. 1-for oil line to governor, in crankcase RF-270, replaced by RF-1225.	2		2
244	RF-1343	**ELBOW** in gear cover, for Military oil filter return line	1		2
246	RJ-159	**OIL SABER** (short) starter side Includes: **PH-550** felt washer. RJ-143-S1, replaced by RJ-159.	1		2
247	RJ-159-A	**OIL SABER** (long) below oil filler tube. Includes: **PH-550** felt washer. RJ-153A-S1 (with PH-245 cork washer), replaced by RJ-159-A.	1		3
249	RK-173	**OIL SLING** for crankshaft	1		2
250	RK-181	**CRANKCASE SPLASH PLATE**	2		4
252	RM-536	**OIL LINE,** crankcase to governor 1/4" tubing 19-1/2" long, with nuts	1		4
253	RM-772	**OIL RETURN LINE** for Military oil filter to gear cover, 1/4" tubing, 12" long with nuts	1		2
255	RM-1161	**OIL PRESSURE LINE** for Military oil filter to governor, 1/4" tubing 22-1/2" long with nuts	1		4
256	RM-1319-L	**FLEXIBLE FUEL LINE,** pump to carburetor 17" long RM-1201-A and RM-1319-B, replaced by RM-1319-L.	1		4
258	RV-28	**MILITARY OIL FILTER** From No. **F-21P.** For **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines. See illustration in rear of manual for service parts list and instructions.	1	6	
259	- - - - -	**OIL FILTER** (commercial type) For **MIL-E-11275-A** Spec engines. Consisting of: **RV-40-S4 CARTRIDGES** (4 pack) **RV-40A-1 BASE ASSEMBLY**	1 1 1	1 3 1	12 4
		NOTE: Beginning with engine Serial No. 3408750, the RV-29-A oil filter is replaced by a **BASE** and **CARTRIDGE** listed above. Replacement cartridges are not interchangeable, therefore RV-29-S4 cartridges must be used for obsolete RV-29-A oil filter. Part number is located on top of cartridge for identification.			
260	SA-65-C	**COVER PLATE** for oil filter pad On **MIL-E-11275-C** and **MIL-E-11275-B** engines.	1		2
262	SD-252	**ENGINE INSTRUCTION AND NAME PLATE** When ordering name plate, give Model, Specification Number and Serial Number for correct stamping.	1		1
263	SD-197-B	**MILITARY IDENTIFICATION PLATE** For **MIL-E-11275-C** Spec engines.	1		1
	SD-197-A	For **MIL-E-11275-B** Spec engines.			
	SD-197	For **MIL-E-11275-A** Spec engines.			
265	SE-48-1	**SCREEN** for flywheel shroud	1	1	1
267	SE-124-AG	**FLYWHEEL SHROUD** for standard open engine with pads for starter, Military air cleaner and oil filter	1	16	8
	SE-124-A	For power units (with starter pad)		15	8
		NOTE: The above are flywheel shrouds for the **MIL-E-11275-C** Spec engines. Because of the various combinations of accessory mounting pads for the **MIL-E-11275-B** and **MIL-E-11275-A** engines, order by giving **Model, Specification** and **Serial Numbers** of engine.			
269	SE-125	**REAR SHROUD COVER,** R.H. side	1	1	3
270	SE-125-A	**REAR SHROUD COVER,** L.H. side	1	1	3
271	SE-126	**LOWER CYLINDER SHROUD,** R.H. side	1		14
272	SE-126-A	**LOWER CYLINDER SHROUD,** L.H. side	1		14
274	SE-127	**CYLINDER HEAD SHROUD,** R.H. side	1	1	2
275	SE-127-A	**CYLINDER HEAD SHROUD,** L.H. side	1	1	2
276	SE-128-B	**CYLINDER HEAT DEFLECTOR,** R.H. side	1	1	
277	SE-128-C	**CYLINDER HEAT DEFLECTOR,** L.H. side	1	1	
279	T-84-H-1	**GOVERNOR ASSEMBLY** for engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec Consisting of:	1	7	
281		**PD-173-A** Nut for adjusting screw	1		1
282		**PI-145** Adjusting screw	1		3

Order parts from nearest *SERVICE STATION* shown in directory following parts list.

IMPORTANT: Always give Model, Specificatitm and Serial Numbers as shown on name plate.

MODEL AVG4D PARTS LIST

Ref No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
283		**PM-76** Governor spring	1		2
284		**RF-1165-A** Restricted oil line fitting	1		1
285		**RF-1281** Tee for oil line	1		1
286		**RM-536** Oil line, case to governor	1		4
288		**TA-112A-S1** Drive shaft assembly	1	2	8
		Consisting of:			
289		**GD-95-A** Gear	1		9
290		**ME-111** Housing bearing	1		6
291		**ME-112** Shaft Bearing	1		6
292		**PA-340** Roll pin for flyweight	2		1
293		**PL-21** Key, Woodruff No. 3	1		1
294		**TA-112-A** Drive shaft	1		6
295		**TC-322D-S1** Flyweight with TC-328D thrust pin	2		3
296		**TC-346-B** Flyweight hub	1		4
298		**XH-9** Taper pin for flyweight hub, No. 2 x 1¼" long	1		1
299		**TC-348-S1** Thrust sleeve and bearing assembly	1		6
		TC-348A-S1, replaced by TC-348-S1.			
300		**TC-367-A** Adjusting screw pin	1		1
301		**TC-363B-2-S1** Housing assembly	1	3	
		Consisting of:			
302		**JK-52** 'O' Ring for cross shaft	1		1
303		**ME-153** Bearing for cross shaft	2		1
304		**PA-294** Dowel pin for housing	2		1
305		**QD-615-A** Gasket for housing	1		1
306		**SA-26** Expansion plug, 5/8"	1		1
307		**TB-109** Tachometer adapter	1		6
308		**TC-363B-2** Housing	1	2	
309		**TC-398-15** Shaft and lever with JK-52 'O' ring	1		2
310		**VB-98A-5** Yoke	1		2
311		**XH-1** Taper pin, No. 0 x ¾" long	1		1
313		**TC-403** Cap for tachometer adapter	1		3
314		**VE-674-A** Ball joint for control rod	2		1
316		**VE-689-A** Control rod, 2¾" long, lever to carb. (with Marvel-Schebler carburetor)	1		1
		VE-689-C (With Zenith carburetor), 1-15/16" long	1		1
320	**T-89-7-S1**	**GOVERNOR ASSEMBLY** For **MIL-E-11275-A** Spec engines.	1	3	3
		Consisting of:			
321		**TC-391-B** Thrust sleeve and bearing	1		2
		TC-391 & TC-391A, replaced by TC-391B.			
322		**TC-395-S1** Housing assembly	1	2	2
		Consisting of:			
323		**PF-18** Pipe plug—1/8" slotted	1		1
324		PF-118 Retainer, replaced by PH-571.			
325		**PH-571** Oil seal—replaces PF-118 Retainer and PH-318-A Seal			
326		**QD-615A** Housing gasket	1		1
327		**RF-269-2** Straight fitting	1		1
328		**SA-52** Plug—1/2" expansion	1		1
329		**TC-395** Housing	1	1	14
330		**TC-398** Cross shaft and lever	1		2
331		**VB-151** Yoke	1		3
332		**XH-1** Pin for yoke—No. 0 x 3/4" long taper	1		1
334		**TC-405 FLYWEIGHT ASSEMBLY** Includes:	1	1	
335		**GD-100A** Gear	1		7
336		**PH-313A** Bushing washer	1		1
337		**TC-322D-S1** Flyweight assembly Includes:	2		3
		TC-322-A, replaced by TC-322D-S1.			
338		**TC-389A-1** Gear Bushing	1		2
		TC-389-1, replaced by TC-389A-1.			
339		**PA-340** Flyweight roll pin	2		1
		XJ-47 Rivet or PA-265 Pin with 2 XI-33 Cotter Pins replaced by PA-340, but drill out holes in governor gear to .196 (No. 9 drill).			
		NOTE: The following governor linkage parts are not included in the T-89-7-S1 governor assembly.			
341		**PD-173A** Governor adjusting screw nut	1		1
342		**PI-145** Governor adjusting screw	1		3
343		**PM-76** Governor spring	1		1
344		**TC-367-A** Adjusting screw pin	1		1
345		**TC-388-1** Governor drive shaft	1		3
346		**VE-549** Governor control rod	1		1
348	**TF-96-4**	**FUEL PUMP ADAPTER** and **PRIMER ASSEMBLY** (with straight handle, for open engines.) Consisting of:	1	1	
349		**JK-50** 'O' Packing ring	1		1
350		**PM-145** Spring	1		1
351		**TA-111-A** Plunger (TA-116 must also be ordered)	1		1
352		**TA-114-S1** Shaft with JK-50 packing	1		1
353		**TA-115** Handle	1		1
354		**TA-116** Cap	1		1
356		**- - - -** Adapter, not serviced separately, order complete Adapter assembly.	1		1
348A	**TF-96-7**	**ADAPTER** and **PRIMER ASSEMBLY** (with bent handle for power units with fuel pump.) Consisting of:	1	1	
349		**JK-50** 'O' Packing ring	1		1
350		**PM-145** Spring	1		1
351		**TA-111-A** Plunger (TA-116 must also be ordered)	1		1
352		**TA-114C-S1** Shaft with JK-50 Packing	1		1
353A		**TA-115-4** Handle	1		1
354		**TA-116** Cap	1		1
355		**XE-65** Set screw	1		1
356		**- - - -** Adapter, not serviced separately, order complete Adapter assembly.	1		1
358	**U-226-A**	**STARTING CRANK**	1	2	4
359	**VE-439-D**	**CONTROL PANEL** VE-559, replaced by VE-439-D.	1		6
360	**VE-471-4**	**PRIMER CONTROL** For power units with fuel pump.	1		1
361	**VE-693-1**	**CHOKE CONTROL**	1		4
362	**WD-47**	**MUFFLER** for 1½" pipe tap	1	3	
363	**WE-243**	**GEAR COVER SPACER** WE-243-1, replaced by WE-243.	1	2	4
364	**XK-7-B**	**PLUG,** 3/4" pipe, hex. head, magnetic For oil drain on **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines.	1		2
	XK-4-B	1/2" pipe plug for **MIL-E-11275-A** Spec	1		1

NOTE: The radio shielded ignition system for these models of engines is different for each of the three Military specifications the engines are built to. The latest Military Specification **MIL-E-11275-C,** specifies a radio shielded magneto adaptable to Military standard ignition wires and spark plugs.

Engines built to Specification **MIL-E-11275-B** can use the latest shielding when service replacement becomes necessary, but all three items: **MAGNETO, SPARK PLUGS** and **WIRE ASSEMBLIES** must be used.

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		Engines built to **MIL-E-11275-A** Specification have a shielded ground wire and switch assembly, but are otherwise similar to MIL-E-11275-B spec engines.			
366	**Y-98-C-S1**	**RADIO SHIELDED MAGNETO** with gear and gasket. Fairbanks-Morse No. **FMXZE4B7-4.** For engines built to **MIL-E-11275-C** specification.	1	7	10
366A	**Y-98-A-S1**	Fairbanks-Morse No. **FMXZE4B7** mag. For engines built to **MIL-E-11275-B** spec.		7	10
366B	**Y-98-S1**	Fairbanks-Morse No. **FMXE4B7-G**..... For engines built to **MIL-E-11275-A** spec. **NOTE:** For replacement, Y-98A-S1 can be used, but omit shielded ground wire. See magneto bulletin in back of manual for service replacement parts lists.		7	
368	YA56A	**ELECTRIC STARTER** (24 volt), Presto-Lite No. MBP-4012T..... **NOTE:** For service repair parts of starting motor, refer to illustration in rear section of manual.	1	17	
369	**YC-10-C**	**STARTING SWITCH**	1		4
371	**YD-311-S1** (MS-51009-1)	**SPARK PLUG,** Champion No. **XMD-21**. For engines built to **MIL-E-11275-C** spec.	4		6
371A	**YD-171-S1**	**SPARK PLUG,** Champion No. **XED-16**.. For engines built to **MIL-E-11275-B** and **MIL-E-11275-A** specifications.			6
		The following Shielded Ignition Wire Assemblies are for engines built to **MIL-E-11275-C** Specification.			
	YD-300-32 (MS-51011-13)	For No. 1 cylinder	1		
374	**YD-300-40** (MS-51011-14)	For No. 2 cylinder	1		
375	**YD-300-23** (MS-51011-10)	For No. 3 cylinder	1		
376	**YD-300-32** (MS-51011-13)	For No. 4 cylinder	1		
		The following Shielded Ignition Wire Assemblies are for engines built to **MIL-E-11275-B** Specification.			
378	**YD-213-H**	For No. 1 cyl. (27-1/2" loom length)	1		4
379	**YD-213-J**	For No. 2 cyl. (39-1/2" loom length)	1		6
380	**YD-213-K**	For No. 3 cyl. (21" loom length)	1		4
381	**YD-213-L**	For No. 4 cyl. (30-1/2" loom length)	1		5
		The following Shielded Ignition Wire Assemblies and Ground Switch Box are for engines built to **MIL-E-11275-A** Specification.			
383	**YD-213-H**	For No. 1 cyl. (27-1/2" loom length)	1		4
384	**YD-213-J**	For No. 2 cyl. (39-1/2" loom length)	1		6
385	**YD-213-K**	For No. 3 cyl. (21" loom lenght)	1		4
386	**YD-213-L**	For No. 4 cyl. (30-1/2" loom length)	1		5
387	**YD-89-J**	**SHIELDED GROUND WIRE ASSEMBLY**	1		3
388	**SA-74**	**COVER** for ground switch box	1		1
389	**YD-63**	**BOX** for ground switch	1		2
390	**YD-215**	**INSULATOR** for switch box	1		1
392	**YC-9-F-S1**	**GROUND SWITCH ASSEMBLY** ..... Includes: SD-109 Tag, PE-72 Washer. YC-9-C, replaced by YC-9-F-S1.	1		2
393	**YL-191**	**GROUND STRAP** for magneto	1		1
394	**YL-352-23**	**WIRE ASSEMBLY** (for remote ground) .. No. 52 (14 GA.) cable, 23" long, with terminals. On **MIL-E-11275-C** and **MIL-E-11275-B** engines.	1		1
396	**YL-356-28**	**STARTER CABLE**	1		4
		STANDARD HARDWARE Except where hardness or plating is indicated, most of the following nuts, washers, capscrews and etc., are of a common variety.			
400	**LK-9**	**HOSE CLAMP,** 2-3/8" I.D. ..... For air cleaner connection.	3		1
401	**LK-24**	**HOSE CLAMP,** 2-1/4" I.D. ..... For elbow at carburetor.	1		1
403	**PB-24**	**SCREW,** 3/8"-24 S.A.E. thread x 1-1/8" long, hexagon head ..... For mounting starting motor.	3		1
405	**PD-10**	**NUT,** 5/16"-24 thread, hexagon steel .. 2-for mounting oil filter pad cover. 2-for mounting starting motor bracket.	4		1
406	**PD-11**	**NUT,** 3/8"-24 thread, hexagon steel .... 1-for magneto stud (upper hole). 8-for connecting rod bolts.	9		1
407	**PD-13**	**NUT,** 1/2"-20 thread, hexagon steel .. For mounting cyl. block to crankcase.	12		1
408	**PD-77**	**NUT,** 1/4"-20 thread, hexagon steel .... 1-for governor adjusting screw pin. 2-for mounting starting switch.	3		1
409	**PD-78**	**NUT,** 5/16"-18 thread, hexagon steel.. 1-for spacer to gear cover (L.H. side). 4-for Military oil filter. 4-for air cleaner mounting.	9		1
410	**PD-79**	**NUT,** 3/8"- 16 thread, hexagon steel ... 1-for magneto screw (lower hole). 2-for muffler adapter flange.	3		1
412	**PD-115-2**	**NUT,** No. 10-32 thread, hex. steel plated For governor control rod and ball joints.	4		1
414	**PD-207**	**NUT,** 7/16"-20 thread, Seez-Proof, hexagon steel. For manifold to cyl. block ..	4		1
416	**PE-3**	**LOCKWASHER,** 1/4" Positive ..... 2-for fuel pump adapter. 6-for crankcase splash plates. 8-for flywheel shroud screen. 32-for air shrouding. 2-for starting switch.	50		1
417	**PE-4**	**LOCKWASHER,** 5/16" Positive ..... 14-for bottom cover. 15-for gear cover and spacer to case. 2-for mounting fuel pump. 2-for mounting carburetor. 6-for bearing plate (flywheel end). 4-for mounting governor housing. 2-for mounting starter support bracket. 2-for oil filter pad cover. 4-for Military oil filter. 4-for air cleaner mounting.	55		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
418	PE-5	**LOCKWASHER,** 3/8" Positive(11/16"OD) For mounting starter.	3		1
419	PE-5-A	**LOCKWASHER,** 3/8" Positive(9/16"O.D. 6-for main bearing plate (take-off end). 2-for muffler adapter flange.	8		1
421	PE-7	**LOCKWASHER,** 1/2" Positive ..... 12-for cylinder block to crankcase studs. 6-for mounting generator drive pulley.	18		1
422	PE-14	**LOCKWASHER,** No. 10 Positive ..... For governor control rod ball joint.	2		1
423	PE-34-A	**LOCKWASHER,** ¼" External 'Everlock' plated ..... 1-for mounting magneto ground strap. 4-for ignition cable clips.	5		1
424	PE-37	**LOCKWASHER,** 5/8" Positive ..... For engine supports to crankcase.	4		1
425	PE-46	**LOCKWASHER,** 5/16" External Everlock For mounting camshaft gear.	3		1
426	PE-46-A	**LOCKWASHER,** 5/16" External Everlock Plated. 2-for mounting gear cover. 4-for mounting air shroud.	6		1
428	PE-56-A	**LOCKWASHER,** 3/8" External Everlock plated ..... 2-for mounting magneto, upper and lower holes. 2-for mounting air shroud (center holes).	4		1
429	PE-76-A	**LOCKWASHER,** 3/8" I.E.T. Everlock, plated ..... For magneto mounting screw.	1		1
430	PE-80	**LOCKWASHER,** 3/8" Internal Everlock For mounting ignition switch.	1		1
432	PF-18	**PIPE PLUG,** 1/8" slotted, steel ..... 5-for taps in oil header tube. 1-for oil filter inlet hole (bottom of case) 1-for oil pump lock screw. 1-for oil header.	8		1
433	PH-14	**PLAIN WASHER,** 5/16" copper ..... 4-for valve inspection cover. 2-for spacer plate to crankcase (at idler gear). Not illustrated.	6		1
434	PH-22-A	**WASHER,** 3/8"I.D. x 11/16"O.D., plain steel, for mounting cylinder heads	34		1
435	PH-79-A	**WASHER,** 7/16" I.D. x 13/16"O.D. x 1/8" thick, plain steel ..... For manifold to cylinder block.	4		1
436	PH-194	**WASHER,** 1/4" I.D. x 5/8" O.D., plain steel, for starter to support bracket.....	1		1
437	PH-332	**WASHER,** 1/8"I.D. x 5/16"O.D. x 1/32" thick, plain steel (T-89-7 gov.) ..... Between governor control rod and lever.	1		1
438	PL-24	**WOODRUFF KEY,** No. 29 ..... For mounting flywheel.	1		1
439	PL-49	**WOODRUFF KEY,** No. 15 ..... For crankshaft gear.	1		1
441	RF-794	**PIPE NIPPLE,** 1/8" x 3/4" long, iron For mounting fuel strainer.	1		1
442	RF-996	**STREET ELL,** 1/8" x 90°..... For mounting fuel strainer.	1		1
443	SA-26	**PLUG,** 5/8" Expansion ..... For camshaft oil hole.	2		1
444	SA-58	**PLUG,** 1-3/8" Expansion ..... For camshaft end hole.	1		1
446	XA-8	**SCREW,** No. 10-32 thread x 1/2" long, steel round head ..... For mounting starter to bracket.	1		1
447	XA-33	**SCREW,** 1/4"-20 thread x 3/8" long, indented hex. head ..... 8-for flywheel shroud screen. 30-for air shrouding. 1-for tap in cylinder block (R.H. side).	39		1
448	XA-34	**SCREW,** 1/4"-20 thread x 1/2" long, indented hex. head ..... 2-for rear shroud covers — upper holes. 6-for crankcase splash plates.	8		1
449	XA-65	**SCREW,** No. 8 x 1/2" long, self-tapping, sheet metal, for mounting control panel.	4		1
451	XD-5	**SCREW,** 1/4"-20 thread x 5/8" long, hexagon head ..... For mounting starter switch.	2		1
452	XD-6	**SCREW,** ¼"-20 thread x ¾" long, hexagon head ..... For mounting fuel pump adapter.	2		1
453	XD-13-1	**SCREW,** 5/16"-18 thread x 1/2" long, 1/8" thick hexagon head (special) ..... For mounting flywheel shroud to gear cover.	4		1
454	XD-14	**SCREW,** 5/16"-18 thread x 5/8" long, hexagon head ..... 14-for crankcase bottom cover. 4-for mounting Military oil filter. 4-for air cleaner mounting.	22		1
455	XD-15	**SCREW,** 5/16"-18 thread x 3/4" long, hexagon head ..... 8-for mounting spacer to gear cover and crankcase. 2-for mounting fuel pump.	10		1
456	XD-16	**SCREW,** 5/16"-18 thread x 7/8" long, hexagon head ..... For mounting governor housing.	4		1
457	XD-17	**SCREW,** 5/16"-18 thread x 1" long, hexagon head ..... 6-for bearing retainer plate (flywheel end). 3-for mounting camshaft gear. 1-for spacer to gear cover. (Not illust.)	10		2
458	XD-19	**SCREW,** 5/16"-18 thread x 1-1/4" long, hexagon head ..... For mounting gear cover.	10		2
460	XD-21	**SCREW,** 5/16"-18 thread x 1½" long, hexagon head ..... For carburetor mounting.	2		2
461	XD-29	**SCREW,** 3/8"-16 thread x 1-1/4" long, hexagon head ..... 6-for mounting main bearing plate — take-off end. 2-for muffler adapter flange.	8		2

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

☆U.S. GOVERNMENT PRINTING OFFICE: 1989-654-030/00034

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
462	XD-30	**SCREW,** 3/8"-16 thread x 1-1/2" long, hexagon head (special hardness) ..... For mounting cylinder heads.	34		2
463	XD-33	**SCREW,** 3/8"-16 thread x 2-1/4" long, hexagon head ..... For mounting magneto (lower hole).	1		2
465	XD-42	**SCREW,** 1/2"-13 thread x 1-1/4" long, hexagon head ..... For mounting generator drive sheave.	6		2
466	XD-52	**SCREW,** 5/8"-11 thread x 1-3/4" long, hexagon head ..... For engine supports to crankcase.	4		2
467	XD-114-1	**SCREW,** 3/8"-16 thread x 1/2" long, hexagon head ..... For mounting flywheel shroud to gear cover.	2		1
469	XD-148	**SCREW,** 5/16"-18 thread x 1-5/8" long, hexagon head ..... For valve inspection cover.	4		2
470	XE-55	**SCREW,** 5/16"-18 thread x 3/8" long, Allen head set ..... For mounting idler stud.	1		1
472	XI-32	**COTTER PIN,** 3/64 x 3/8" long ..... For governor control rod. (MIL-E-11275-A)	1		1
474	XJ-58	**RIVET,** 1/8" dia. blind ..... 4-for instruction plate mounting. 4-for Military identification plate. XA-67 self tapping screw, replaced by XJ-58, but No. 30 drill hole required.	8		1
475	XK-1	**PLUG,** 1/8", pipe, squarehead ..... For inlet manifold.	1		1
476	XK-2	**PLUG,** 1/4", pipe squarehead ..... For manifold, on MIL-E-11275-C and MIL-E-11275-B Spec engines.	2		1
477	XK-3	**PIPE PLUG,** 3/8" sq. head, in gear cover..... For power units and MIL-E-11275-A Spec engines.	1		2

REPAIR PARTS LIST

FOR

POWER UNIT HOUSE PARTS

AND

ACCESSORIES COMMONLY SUPPLIED

ON ENGINE

WISCONSIN ENGINES

IMPORTANT

THE FOLLOWING SECTION IS INTENDED TO BE AN AID IN SELECTING SERVICE PARTS ONLY IF THEY HAD ORIGINALLY BEEN SUPPLIED WITH THE ENGINE.

SHOULD IT BE DESIRED TO CONVERT AN ENGINE TO USE ANY ACCESSORIES, CONTACT WISCONSIN MOTOR CORPORATION OR AN AUTHORIZED DEALER OR DISTRIBUTOR BEFORE ORDERING PARTS. IN MOST CASES, A CONVERSION CAN ONLY BE MADE IF MAJOR ENGINE PARTS ARE ALSO CHANGED.

MODEL MVG4D POWER UNIT HOUSE PARTS

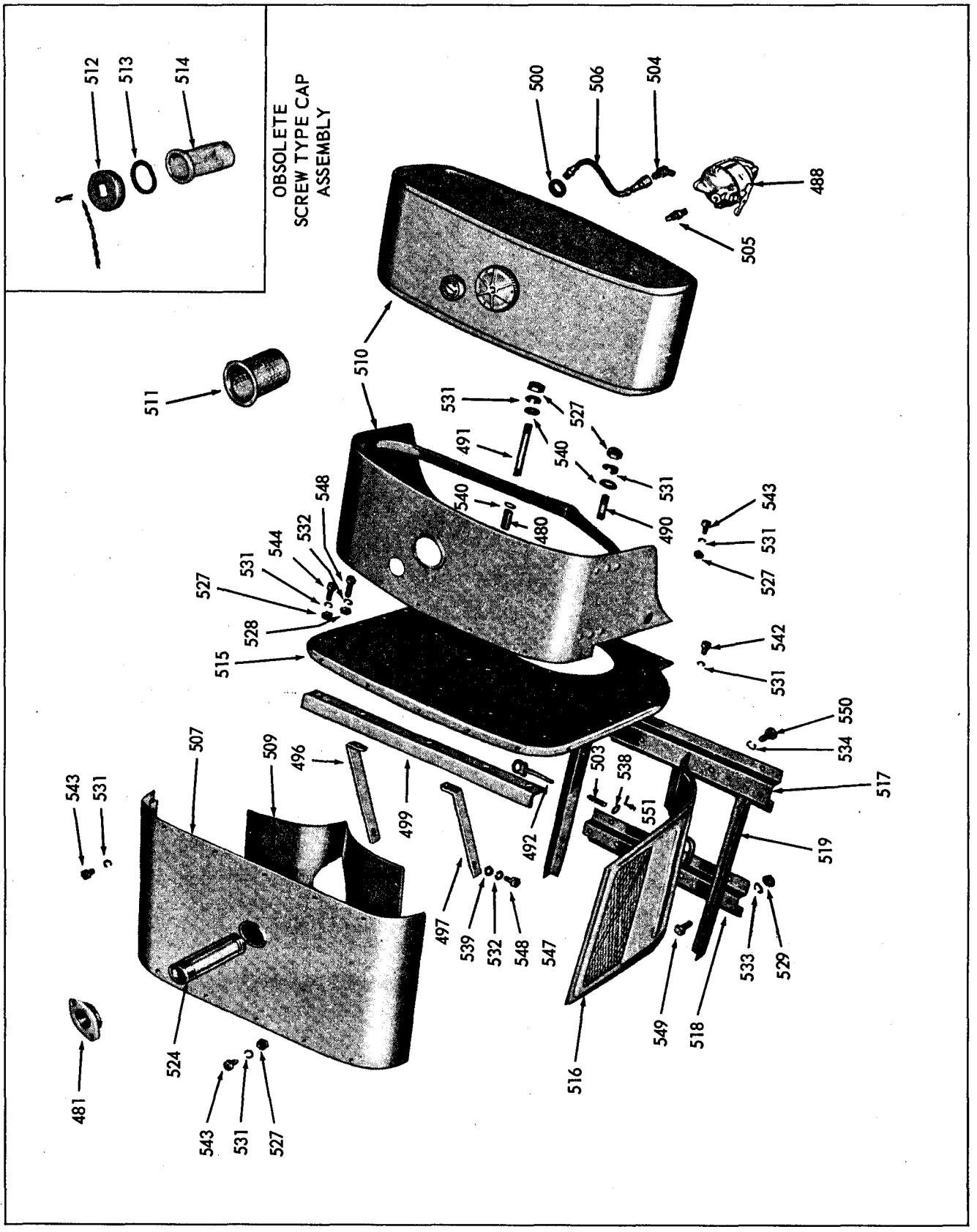


Fig. 65, ENGINE HOUSE AND FUEL TANK GROUP
Parts are identified by reference number. See parts list for correct part number.

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MODEL MVG4D POWER UNIT HOUSE PARTS

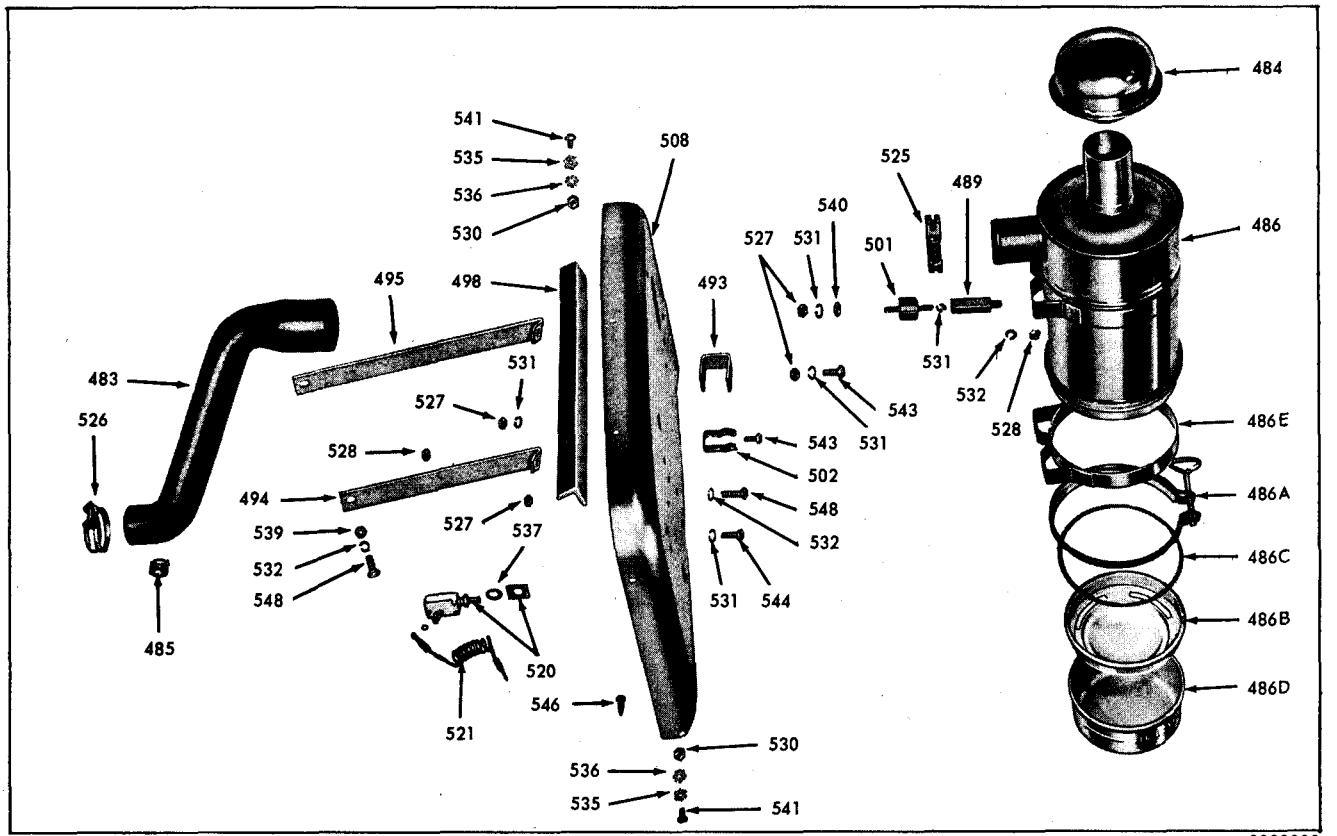


Fig. 66, END PANEL AND MILITARY AIR CLEANER per MIL-E-11275-C specification 292209C

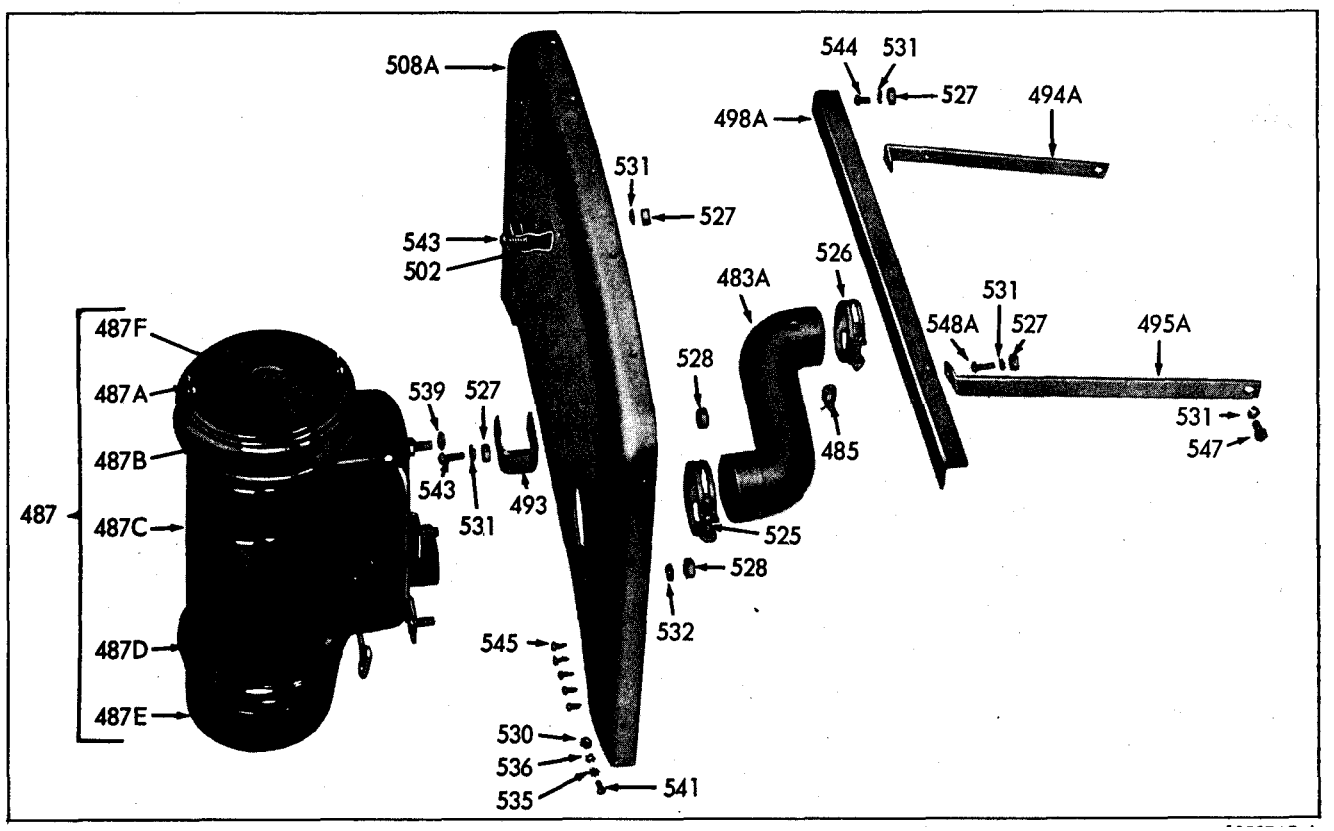


Fig. 67, END PANEL AND AIR CLEANER per MIL-E-11275-B and MlL-E-11275-A specifications 125976C-A
Parts are identified by reference number. See parts list for correct part number.

MODEL MVG4D POWER UNIT HOUSE PARTS

NOTE: POWER UNITS BUILT TO **MIL-E-11275-C** SPEC ARE EQUIPPED WITH **MILITARY AIR CLEANER** MS-35875-3, AS ILLUSTRATED IN *Fig. 66.* HOUSE AND AIR CLEANER MOUNTING PARTS ARE INTERCHANGEABLE FOR ENGINES BUILT TO **MIL-E-11275-C, MIL-E-11275-B** OR **MIL-E-11275-A,** EXCEPT WHERE NOTED BY THE MILITARY SPECIFICATION NUMBER.

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
480	-397	**SPACER** between rear panel and cylinder block, L. H. side	1		1
481	-132	**FLANGED MUFFLER ADAPTER** (female). Refer to Fig. 51 for male half.	1		10
483	-162-S1	**RUBBER ELBOW ASSEMBLY** for air cleaner connection. For **MIL-E-11275-C** Includes LO-88 drip plug.	1	1	
483A	-88A-S1	**RUBBER ELBOW** for air cleaner per **MIL-E-11275-B** and **MIL-E-11275-A**			12
484	-62	**WEATHER CAP** for air cleaner on **MIL-E-11275-C** Spec engines	1	1	
485	-88	**DRIP PLUG ASSEMBLY** for carburetor In air cleaner connection.	1		1
486	-138-S1 -35875-3	**AIR CLEANER** (6" dia.) Donaldson Co. No. **KAX00-0354** or-0405 for engines built to **MIL-E-11275-C** spec. Service parts: Donaldson part numbers. **Body assembly**—not serviced separately, order complete air cleaner.	1	6	
486A		**P10-1362** Oil cup clamp assembly	1		3
486B		**P10-1360** Oil cup assembly (inner)	1		6
486C		**P10-1361** Cup gasket	1		1
486D		**P-17703** Oil cup (outer)	1		10
486E		**AAH00-0343** Mounting band assembly	2		6
487	-89-S1	**AIR CLEANER** (5-1/4" dia.) Comm. type Donaldson No. **FCA06-5210** per **MIL-E-11275-B** and **MIL-E-11275-A.** Service Parts: Donaldson part numbers.		7	8
487A		**P-2274** Wing nut	2		1
487B		**P-8730** Hood assembly	1		6
487C		**Body assembly** — not serviced — order complete air cleaner	1		
487D		**P-2706** Oil cup retaining clamp assembly	1		3
487E		**P-8733** Oil cup assembly	1		8
487F		**P-6921** Jam nut	1		1
		NOTE: LO-89-S1 is replaced by LO-160-S1, or use LO-138-S1 Military air cleaner and necessary conversion parts.			
488	-19	**FUEL STRAINER,** Tillotson OW-418-T With shut-off valve. **NOTE:** See illustration in back of manual for service parts list of fuel strainers	1		6
489	-564	**STUD** for air cleaner mounting on **MIL-E-11275-C** Spec engines	4		3
490	-565	**STUD** for rear panel to block (R.H. side) XD-7 screw, replaced by PC-565.	1		2
491	-566	**STUD** for rear panel to block (L.H. side) XD-145 screw, replaced by PC-566.	1		3
492	-323	**DOOR CLIP**	2		3
493	-491	**BRACKET** for starting crank	1		2
494	-521-A	**BRACE** to front panel, L. H. side For **MIL-E-11275-C** spec. engines.	1		12
	-521	For **MIL-E-11275-B** and **MIL-E-11275-A.**			5
495	PG-522-A	**BRACE** to front panel, R. H. side For **MIL-E-11275-C** spec. engines.	1	1	
495A	PG-522	For **MIL-E-11275-B** and **MIL-E-11275-A.**			6
496	PG-523-A	**BRACE** to rear panel, L. H. side For **MIL-E-11275-C** spec. engines.	1		12
	PG-523	For **MIL-E-11275-B** and **MIL-E-11275-A.**			5
497	PG-524-A	**BRACE** to rear panel, R. H. side For **MIL-E-11275-C** spec. engines.	1		8
	PG-524	For **MIL-E-11275-B** and **MIL-E-11275-A.**			4
498	PG-525-A	**ANGLE** for reinforcing front panel For **MIL-E-11275-C** spec. engines.	1	1	6
498A	PG-525	For **MIL-E-11275-B** and **MIL-E-11275-A.**		1	6
499	PG-526-1	**ANGLE** for reinforcing rear panel For **MIL-E-11275-C** spec. engines.	1	1	7
	PG-526	For **MIL-E-11275-B** and **MIL-E-11275-A.** PG-526-1 can be used in place of PG-526.		1	7
500	PH-198	**GROMMET** for fuel line	1		1
501	PH-542	**VIBRATION DAMPNER** for air cleaner on **MIL-E-11275-C** spec. engines	4		3
502	PK-87	**SPRING CLIP** for crank mounting	1		1
503	PM-137	**SPRING** for door clip	2		1
504	RF-1225	**ELBOW** in fuel strainer outlet	1		1
505	RM-1280	**STAND PIPE ASSEMBLY** for fuel tank	1		2
506	RM-1319-J	**FUEL LINE,** 4" long, fuel strainer to pump	1		2
507	WE-247-AT	**CANOPY**	1	6	
508	WE-248F-1-T	**FRONT PANEL** for **MIL-E-11275-C** spec.	1	6	4
508A	WE-248-33-T	For **MIL-E-11275-B** spec. engines.		6	4
	WE-248-12-T	For **MIL-E-11275-A** spec. engines. **NOTE:** Because of the numerous special front panels for this model of engine, give Model, Specification and Serial Number when ordering replacement.		6	8
509	WE-249-AT	**HEAT DEFLECTOR**	1	1	4
510	WE-250-ET-S1	**FUEL TANK** and **SUPPORT ASSEMBLY** For **MIL-E-11275-C** and **MIL-E-11275-B.** Includes:	1	23	
		CAP, AC Spark Plug Co. No. RC-15634, sheet metal "Easy-on" type	1		4
511		**RD-132-B** screen (3-3/16 dia. x 4½" long)	1		3
		STAND PIPE, Wis. Motor No. RM-1280 **NOTE:** The above tank cap replaced the following cap set-up, but is not interchangeable.	1		2
512	(Obsolete)	**RC-109-S1** Cap Assembly (brass, 3-7/16"-16 thread, screw-on type) with gasket and chain	1		8
513		**QD-728** Gasket	1		1
514		**RD-132** Screen 2-3/4" dia. x 5" long)	1		3

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D POWER UNIT HOUSE PARTS

Ref NO.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WE-250-BT-S1	**FUEL TANK** and **SUPPORT** with **RC-104-S1** Cap Assembly for **MIL-E-11275-A** spec. engines ..... (2"-18 thread, brass screw-on cap). Includes: QD-694 Gasket, RG-34 Vent Assembly, RD-127 Screen, Chain and Mounting Clips. For complete replacement, use **WE-250-ET-S1** Fuel Tank Assembly which includes fuel gauge.	1	17	4
515	WE-251A-33-T WE-251A-17-T	**REAR PANEL** for **MIL-E-11275-C** spec. For **MIL-E-11275-B** and **MIL-E-11275-A**. WE-251A-33-T can be used in place of WE-251A-17-T.	1	11	8
516	WE-252-T	**DOOR**	2	6	
517	WE-253-A	**ENGINE SUPPORT** – take-off end ..... (1-5/8" high). For **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines.	1	4	5
	WE-253	1-1/2" high, for **MIL-E-11275-A** engines		3	12
518	WE-254-A	**ENGINE SUPPORT** – flywheel end ..... (1-5/8" high). For **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines.	1	3	12
	WE-254	(1-1/2" high). For **MIL-E-11275-A** engines		3	
519	WE-255	**SIDE RAIL**	2	1	4
520	YC-9-F-S1	**GROUND SWITCH ASSEMBLY** ..... Includes: SD-109 Tag, PE-72 Lockwasher YC-9-C, replaced by YC-9-F-S1.	1		2
521	YL-352-23	**GROUND WIRE** for **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines	1		1
		STANDARD HARDWARE			
524	LJ-337	**PIPE NIPPLE**, 1-1/2" x 9-1/4" long .. For mounting exhaust muffler.	1	2	
525	LK-9	**HOSE CLAMP**, 2-3/8" I.D. ..... For air cleaner connection, cleaner end.	1		1
526	LK-24	**HOSE CLAMP**, 2-1/4" I.D. ..... For air cleaner connection, carburetor end.	1		1
527	PD-77	**NUT**, 1/4"-20 thread, hexagon steel .. 5-for reinforcing angles. 7-for fuel tank support to rear panel. 4-for heat deflector to canopy. 3-for mounting crank support and clip. 4-for vibration dampner mounting. 2-for rear panel studs.	25		1
528	PD-78	**NUT**, 5/16"-18 thread, hexagon steel.. 4-for mounting air cleaner. 4-for braces to rear and front panels.	8		1
529	PD-79	**NUT**, 3/8"-16 thread, hexagon steel .... For side rails to engine supports.	4		1
530	PD-115	**NUT**, No. 10-32 thread, hexagon steel For front panel to side and top of flywheel shroud.	4		1
531	PE-3	**LOCKWASHER**, 1/4" Positive ..... 14-for canopy. 5-for reinforcing angles. 8-for tank support to rear panel. 5-for rear panel to engine support. 4-for heat deflector to canopy. 3-for mounting crank support and clip. 2-for rear panel studs. 8-for vibration dampner mounting.	49		1
532	PE-4	**LOCKWASHER**, 5/16" Positive ..... 4-for mounting air cleaner. 6-for mounting house braces.	10		1
533	PE-5	**LOCKWASHER**, 3/8" Positive ..... For side rails to engine supports.	4		1
534	PE-37	**LOCKWASHER**, 5/8" Positive ..... For engine supports to crankcase.	4		1
535	PE-45	**LOCKWASHER**, No. 10 External 'Everlock' ..... For front panel to flywheel shroud.	4		1
536	PE-78-A	**LOCKWASHER**, No. 10 internal-external 'Everlock' between panel and flywheel shroud	4		1
537	PE-80-A	**LOCKWASHER**, 3/8" Internal 'Everlock' For ground switch.	1		1
538	PH-2	**PLAIN WASHER**, 7/16" I.D. x 1/16" thick steel, for door clip	2		1
539	PH-77	**PLAIN WASHER**, 5/16" I.D. x 1/16" thick steel ..... 1-for air cleaner support screw. 2-for house braces to manifold.	3		1
540	PH-196	**PLAIN WASHER**, 1/4" I.D. x 1/16" thick, steel..... 3-for rear panel studs. 2-for vibration dampner (lower holes).	5		1
541	XA-8	**SCREW**, No. 10-32 thread x ½" long, round head ..... For front panel to flywheel shroud.	4		1
542	XA-33	**SCREW**, ¼"-20 thread x 3/8" long, round head or indented hexagon head .. For rear panel to engine support.	5		1
543	XA-34	**SCREW**, ¼"-20 thread x ½" long, round head or indented hexagon head ..... 8-for fuel tank support. 14-for canopy and tank support. 4-for heat deflector. 3-for starter crank support.	29		1
544	XA-35	**SCREW**, 1/4"-20 thread x 5/8" long, round head or indented hexagon head .. For mounting reinforcing angles.	5		1
545	XA-65	**SCREW**, No. 8 x ½" long, self tapping, sheet metal..... For front panel (MIL-E-11275-B and -A)	5		1
546	XA-105	**SCREW**, No. 14 x 5/8" long, self tapping, sheet metal..... For front panel to shroud. (MIL-E-11275-C)	3		1
547	XD-4	**SCREW**, ¼"-20 thread x ½" long, hexagon head. (MIL-E-11275-B, MIL-E-11275-A) For house braces to manifold.	2		1
548	XD-15	**SCREW**, 5/16"-18 thread x ¾" long, hex. 4-for mounting house braces to front and rear panels. 2-for house braces to manifold (MIL-E-11275-C spec. engines)	6		1
548A	XA-36	**SCREW**, 1/4"-20 thread x 3/4" long, round head or indented hexagon head .. For mt'g. house braces. (MIL-E-11275-B)	4		1
549	XD-25	**SCREW**, 3/8"-16 thread x 3/4" long, hexagon head ..... For side rails to engine supports.	4		1
550	XD-51	**SCREW**, 5/8"-11 thread x 1-1/4" long, hexagon head ..... For mounting engine supports to case.	4		2
551	XI-23	**COTTER PIN**, 1/8" x 3/4" long ..... For door clips.	2		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MILITARY OIL FILTER MOUNTING FOR MODEL MVG4D POWER UNIT

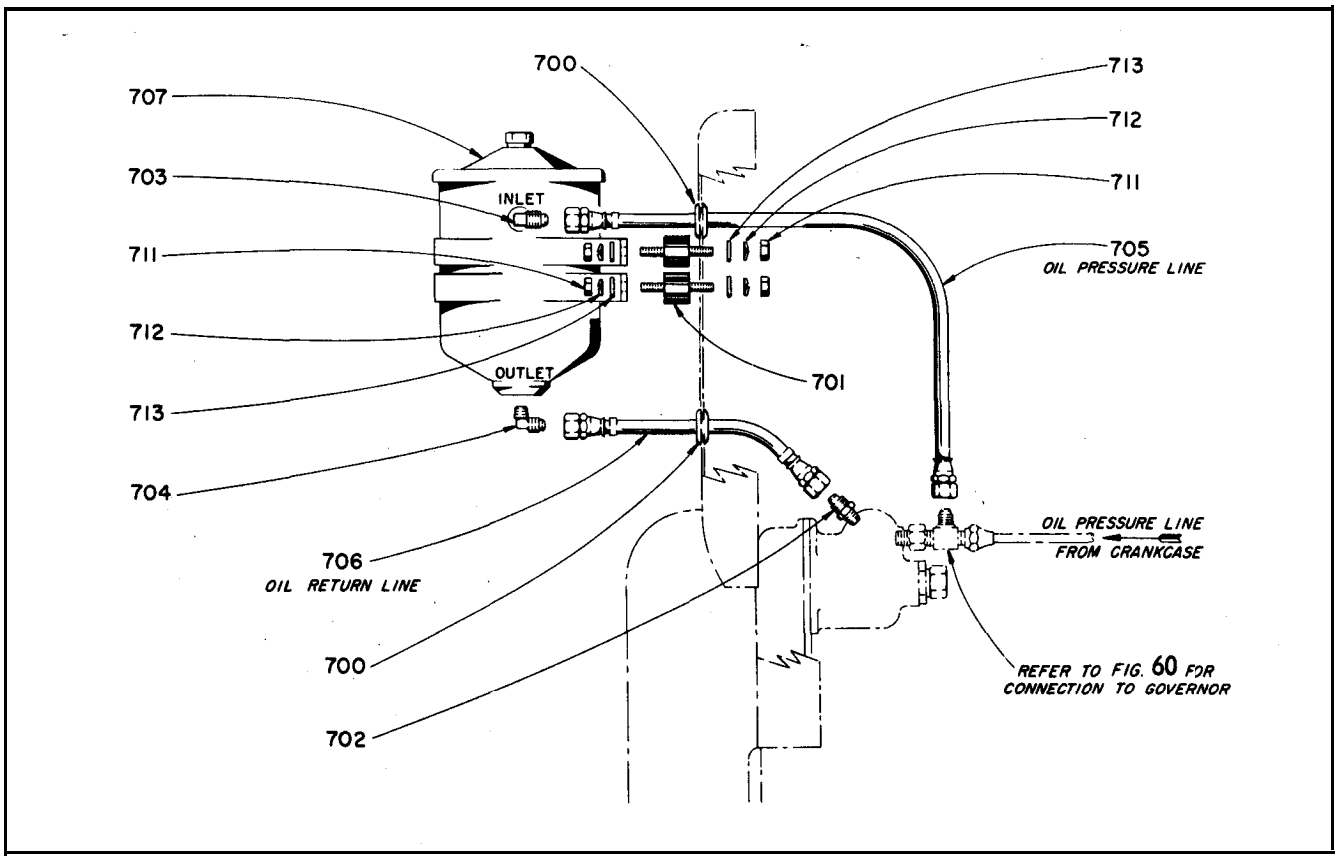


Fig. 68

Ref. No.	Part Number	Description	No. Req	Net Lb	Net Oz	Wt. Oz
700	PH-198	**GROMMET** for oil lines, in power unit house panel	2			1
701	PH-542	**VIBRATION DAMPNER** for oil filter on **MIL-E-11275-C** Spec engines	4			3
702	RF-1359	**45° ELBOW FITTING** in governor housing for oil return line RF-269 straight fitting, repl'd. by RF-1359.	1			1
703	RF-270-4	**RESTRICTED ELBOW** in oil filter inlet (top hole)	1			1
704	RF-1225	**ELBOW** in bottom of oil filter for oil return line	1			1
	RM-1320-C	**FLEXIBLE LINE,** oil pressure, 22-3/4" long on **MIL-E-11275-C** Spec engines **RM-477** ¼" tubing with nuts, 18" long, for **MIL-E-11275-B** Spec	1 1			6 4
706	RM-1320-G	**FLEXIBLE LINE,** oil return, 16-1/4" long on **MIL-E-11275-C** Spec engines **RM-921** ¼" tubing with nuts, 14-1/2" long, for **MIL-E-11275-B** Spec	1 1			4 4
707	RV-28	**OIL FILTER, FRAM No. F-21-P** See exploded view and parts list on following page for service parts and instructions.	1	6		

Ref. No.	Part Number	Description	No. Req	Net Lb	Net Oz	Wt. Oz
		STANDARD HARDWARE				
711	PD-77	**NUT,** 1/4"-20 thread, hexagon steel For mounting oil filter to house panel.	8			1
712	PE-3	**LOCKWASHER,** 1/4" Positive For mounting oil filter to house panel.	8			1
713	PH-196	**PLAIN WASHER,** 1/4" I.D. x 5/8" O.D. x 1/16" thick, steel For mounting oil filter to house panel.	8			1
	XD-5	**SCREW,** 1/4"-20 thread x 5/8" long, hexagon head (not illustrated) For mounting oil filter to house panel on **MIL-E-11275-B** Spec engines.	4			1

Order parts from nearest *SERVICE STATION* shown in directory following parts list.

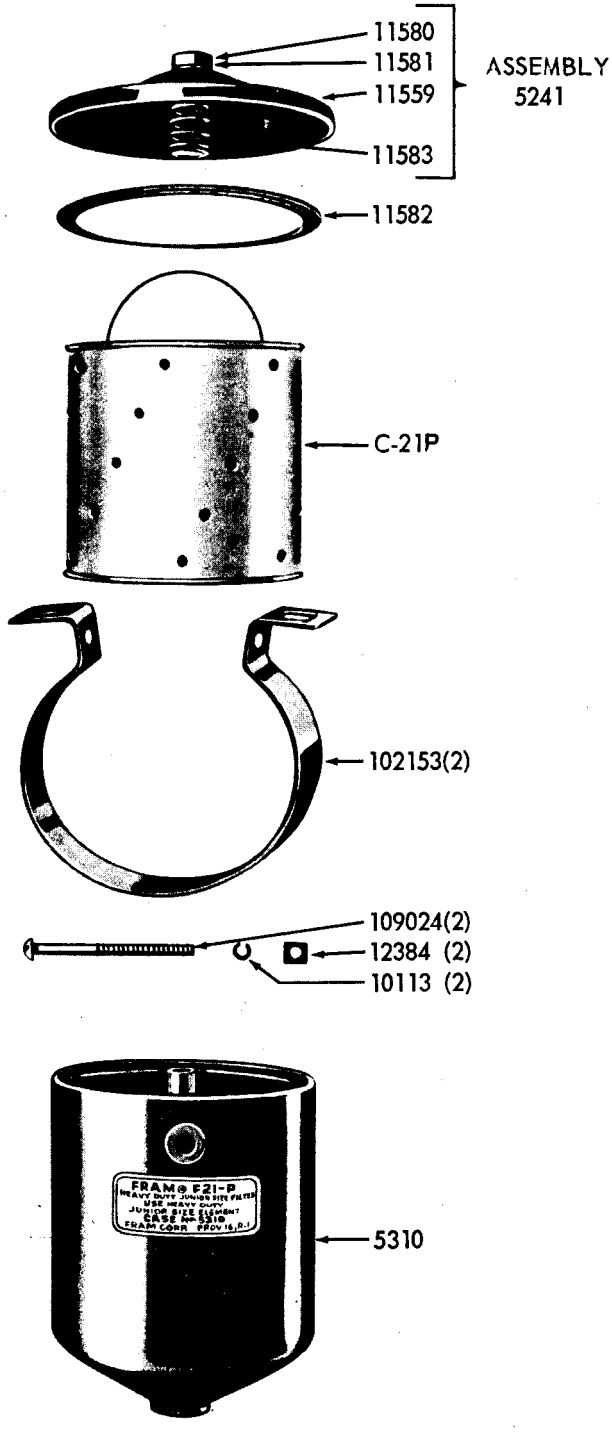
IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

PARTS LIST FOR FRAM MILITARY TYPE OIL FILTER

WISCONSIN MOTOR PART NO. RV-28
FRAM CORP. PART NO. F21-P

FRAM CORPORATION - PROVIDENCE 16, RHODE ISLAND

All numbers shown are FRAM part numbers



194535C-A1

PARTS

11580 - Cap Screw)
11581 - Cap Screw Gasket) Assembly
11559 - Cover) 5241
11583 - Cover Spring)
11582 - Cover Gasket
C-21P - Cartridge
102153 - Strap (2)
109024 - Bolt (2)
12384 - Nut (2)
10113 - Lock Washer (2)
5310 - Filter Body Assembly

Fram F21-P Oil Filter

Ordnance Part No. 540-501

Ordnance Stock No. H 016-054-0501

Conforms To Federal Spec. F-F-351 For Type 1, Class 2, Heavy Duty Junior Size

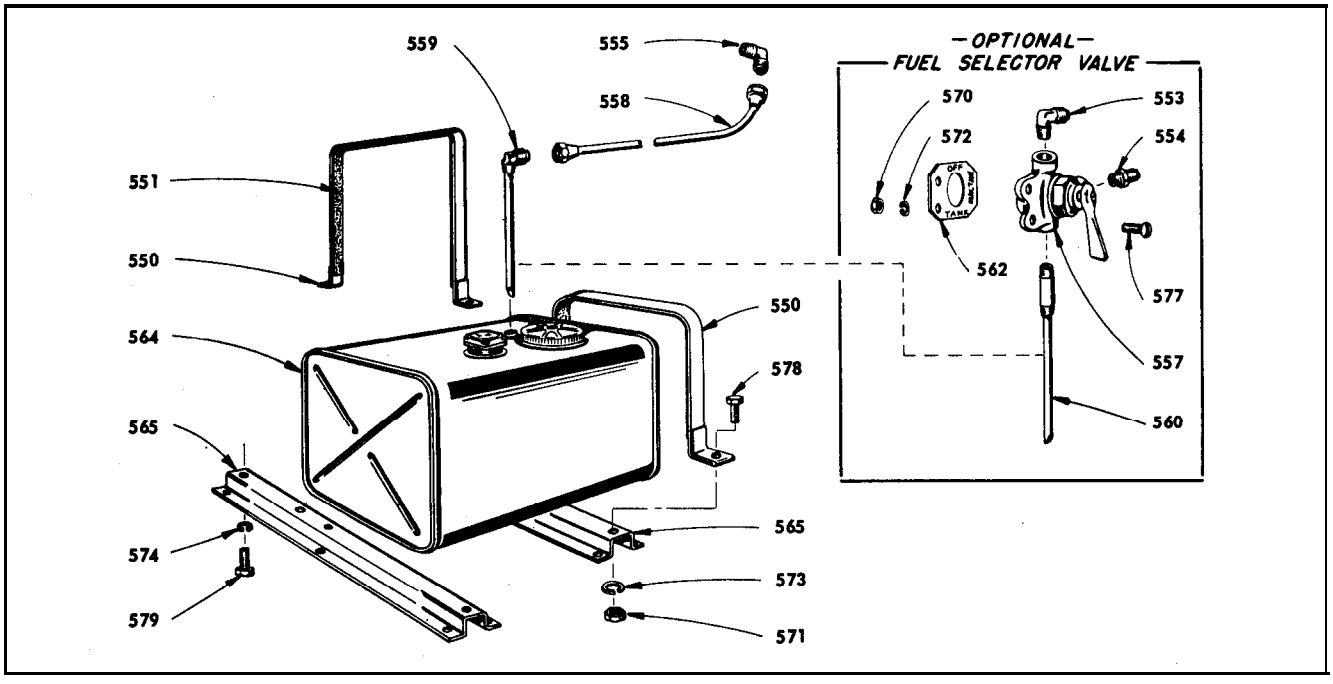
SERVICE INSTRUCTIONS

1. **Remove Cover**
2. **Remove Cartridge,**
   Clean Out Sludge
   Note: Do not remove 11562's pacer from center-tube
3. **Install New C-21P Cartridge**
4. **Install New Cover Gasket 11582**
5. **Reinstall Cover**
6. **Add Oil to Compensate For Filter**
7. **Run Engine For Five Minutes and Check For Leaks**
8. **Recheck Oil Level**

Refer to engine specification or end product specification for correct mounting parts and oil lines, as this filter may be mounted in various locations on the engine or unit.

Order parts from nearest *SERVICE STATION* shown in directory following parts list.
***IMPORTANT:* *Always give* Model, Specification and Serial Numbers as shown on name plate.**

SIDE MOUNT FUEL TANK MOUNTING FOR MODEL MVG4D



Fig, 69

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
550	PG-455	**STRAP** for fuel tank	2	1	1
551	PH-244-A	**FELT** for fuel tank strap	2		2
553	RF-171	**ELBOW,** in selector valve, for fuel line connection from auxiliary tank	1		2
554	RF-269	**STRAIGHT FITTING,** in selector valve For fuel line to fuel strainer.	1		1
555	RF-1225	**ELBOW,** in fuel strainer inlet	1		1
557	RG-36-A	**FUEL SELECTOR VALVE**	1		6
558	RM-524	**FUEL LINE,** tank or selector valve to strainer, ¼" tubing, 31" long, with nuts	1		3
559	RM-1206-A	**SUCTION TUBE** with elbow	1		3
560	RM-1206-AA	**SUCTION TUBE** with pipe nipple (Used with selector valve).	1		3
562	SD-154-B	**INDICATOR TAG** for selector valve	1		1
564	WE-278-D-S1	**FUEL TANK,** 9 gal. capacity For **MIL-E-11275-C** and **MIL-E-11275-B.** Includes:	1	12	
		CAP, AC Spark Plug Co. No. RC-15634, sheet metal 'Easy-on' type	1		8
		SCREEN, Wis. Motor No. RD-132-B	1		2
		TUBE, Wis. Motor No. RM-1206-A	1		2
		NOTE: The above tank cap replaces the following cap set-up and is not interchangeable.			
		RC-109-S1 Cap Assembly (brass, 3-7/16"-16 thread). Includes: QD-728 Gasket, RD-132 Screen and Chain			6
	WE-278A-S1	**TANK ASSEMBLY** for **MIL-E-11275-A** Spec engines. Includes:		11	3
		RM-1206-AA Suction tube			3
		RC-104-S1 Cap assembly, (2"-18 thread brass screw-on cap) Includes:			4
		RD-127 Screen			
		RG-34 Air vent assembly			
		For complete replacement, use WE-278D-S1 Fuel Tank Assembly which includes fuel gauge.			

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
565	WE-281-B	**ENGINE SUPPORT** (1-5/8" high) For **MIL-E-11275-C** and **MIL-E-11275-B.**	2	9	
	WE-281	**ENGINE SUPPORT** (1-1/2" high) For **MIL-E-11275-A** Spec. engines.		8	8
		STANDARD HARDWARE			
570	PD-77	**NUT,** 1/4"-20 thread, hexagon steel.... For mounting indicator tag.	2		1
571	PD-79	**NUT,** 3/8"-16 thread, hexagon steel.... For fuel tank straps to supports.	4		1
572	PE-3	**LOCKWASHER,** 1/4" Positive For mounting indicator tag.	2		1
573	PE-5	**LOCKWASHER,** 3/8" Positive For fuel tank straps to supports.	4		1
574	PE-37	**LOCKWASHER,** 5/8" Positive For engine supports to crankcase.	4		1
577	XA-35	**SCREW,** 1/4"-20 thread x 5/8" long, indented hexagon head For mounting indicator tag.	2		1
578	XD-27	**SCREW,** 3/8"-16 thread x 1" long, hexagon head For fuel tank straps to supports.	4		1
579	XD-51	**SCREW,** 5/8"-11 thread x 1" long, hexagon head For engine supports to crankcase.	4		2

Order parts from nearest *SERVICE STATION* shown in directory following parts list.

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

SIDE MOUNT AIR CLEANER
FOR MVG4D ENGINE PER MIL-E-11275-B AND MIL-E-11275-A SPECIFICATIONS

(REFER TO FIG. 57 FOR AIR CLEANER MOUNTING ON MIL-E-11273-C SPECIFICATIONS)

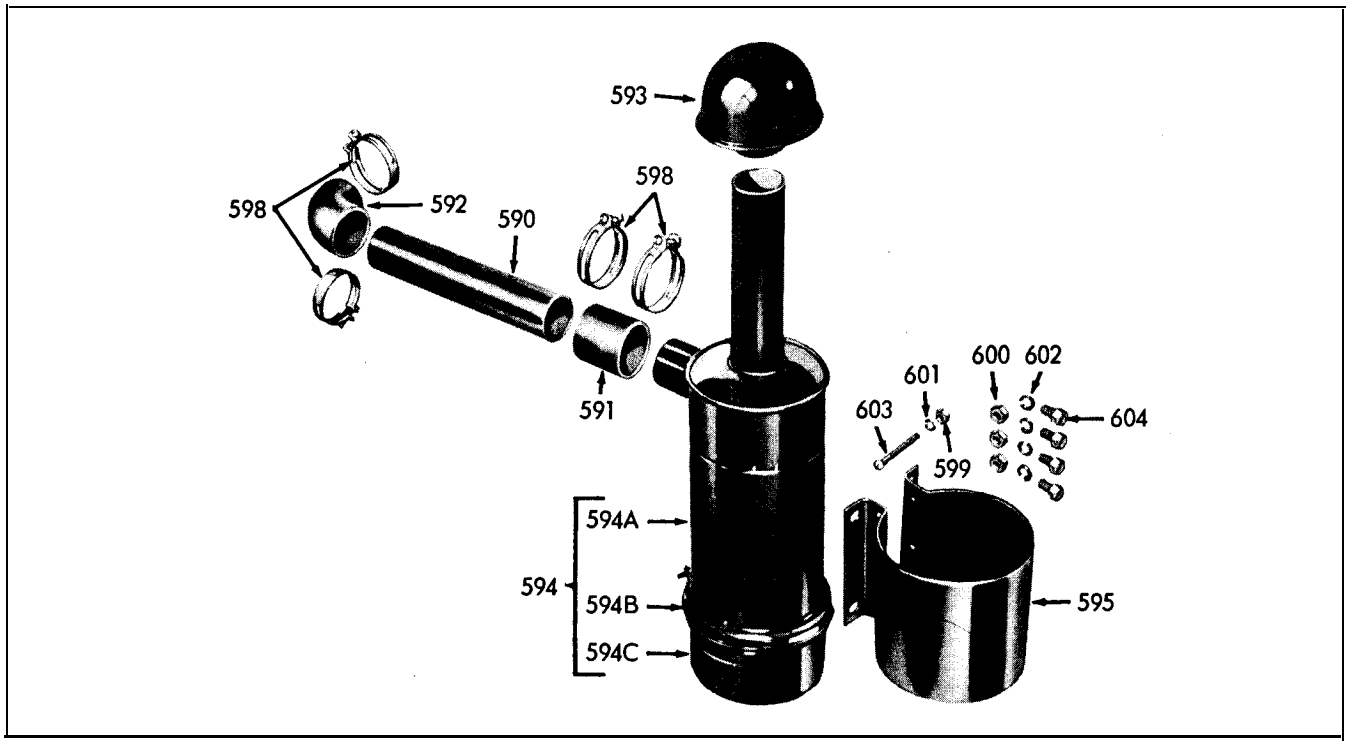


Fig. 70

125975C-1A

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
590	LJ-131	**TUBE** for air cleaner to carburetor elbow	1	1	6
591	LL-18	**RUBBER HOSE** for air cleaner tube	1		2
592	LL-89	**RUBBER ELBOW** for air cleaner tube	1		6
593	LO-62	**AIR STACK CAP**	1	1	
594	LO-90	**AIR CLEANER,** (5-1/4" dia.) obsolete Donaldson No. FCA05-5200 or A552.	1	5	
594A		- - - - Body assembly—not serviced—Order complete air cleaner.			
594B		**P-2706** Oil cup clamp assembly.....	1		3
594C		**P-8723** Oil cup assembly.....	1		8
		For replacement of LO-90 use **LO-159-S1** (FGA05-2521)		5	
		Service parts for LO-159-S1:			
		P-17244 Oil cup (outer)	1		5
		P-17242 Oil cup (inner)	1		3
		P-2706 Oil cup clamp assembly	1		3

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		STANDARD HARDWARE			
598	LK-9	**HOSE CLAMP,** 2-3/8" I.D. ..... For air cleaner connections.	3		1
	LK-24	**HOSE CLAMP,** 2-1/4" I.D., at carburetor end	1		1
599	PD-77	**NUT,** 1/4"-20 thread, hexagon steel.... For air cleaner strap clamping screws.	3		1
600	PD-78	**NUT,** 5/16"-18 thread, hexagon steel .. For air cleaner strap mounting.	3		1
601	PE-3	**LOCKWASHER,** 1/4" Positive ..... For air cleaner strap clamping screws.	3		1
602	PE-4	**LOCKWASHER,** 5/16" Positive ..... For air cleaner strap mounting.	4		1
603	XA-85	**SCREW,** 1/4"-20 thread x 2-1/2" long, round head ..... For air cleaner strap clamping.	3		1
604	XD-14	**SCREW,** 5/16"-18 thread x 5/8" long, hexagon head ..... For air cleaner strap mounting.	4		1

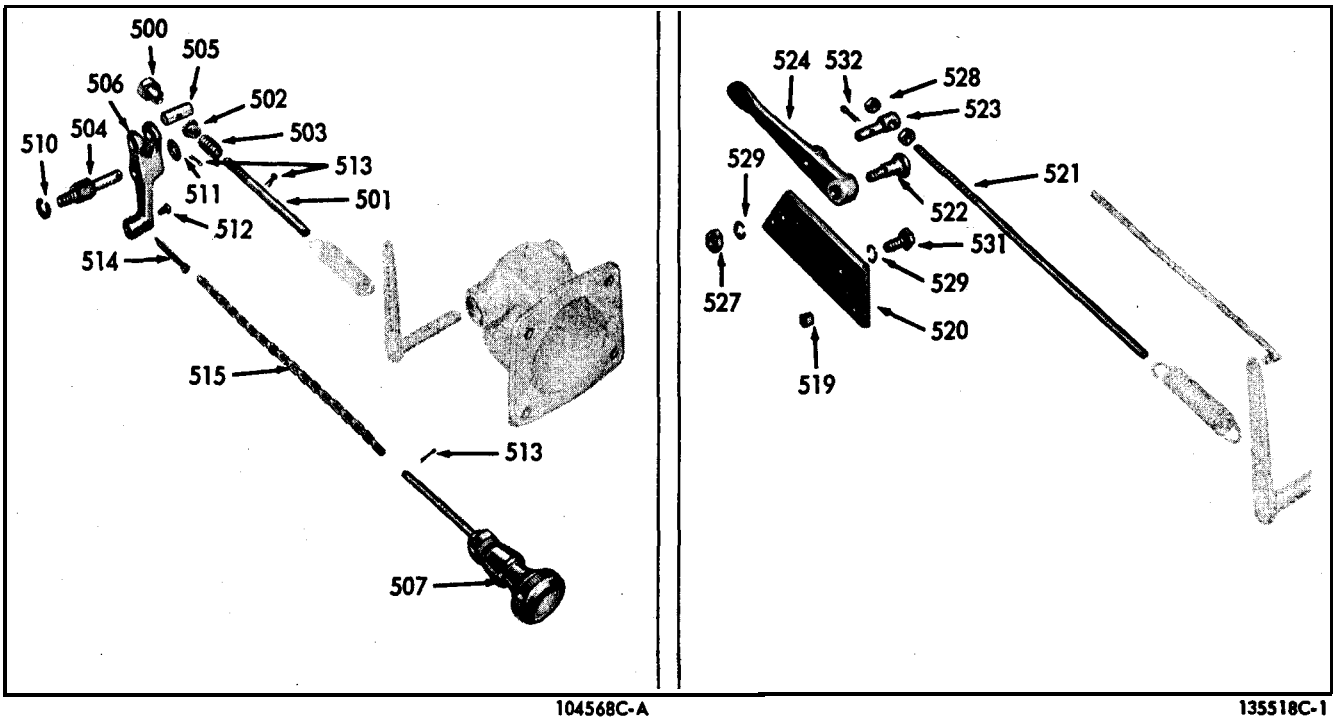
Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

TT-61-C-1 VARIABLE SPEED GOVERNOR CONTROL ASSEMBLY

TT-61-D TWO SPEED GOVERNOR CONTROL ASSEMBLY

FOR MODEL MVG4D ENGINE



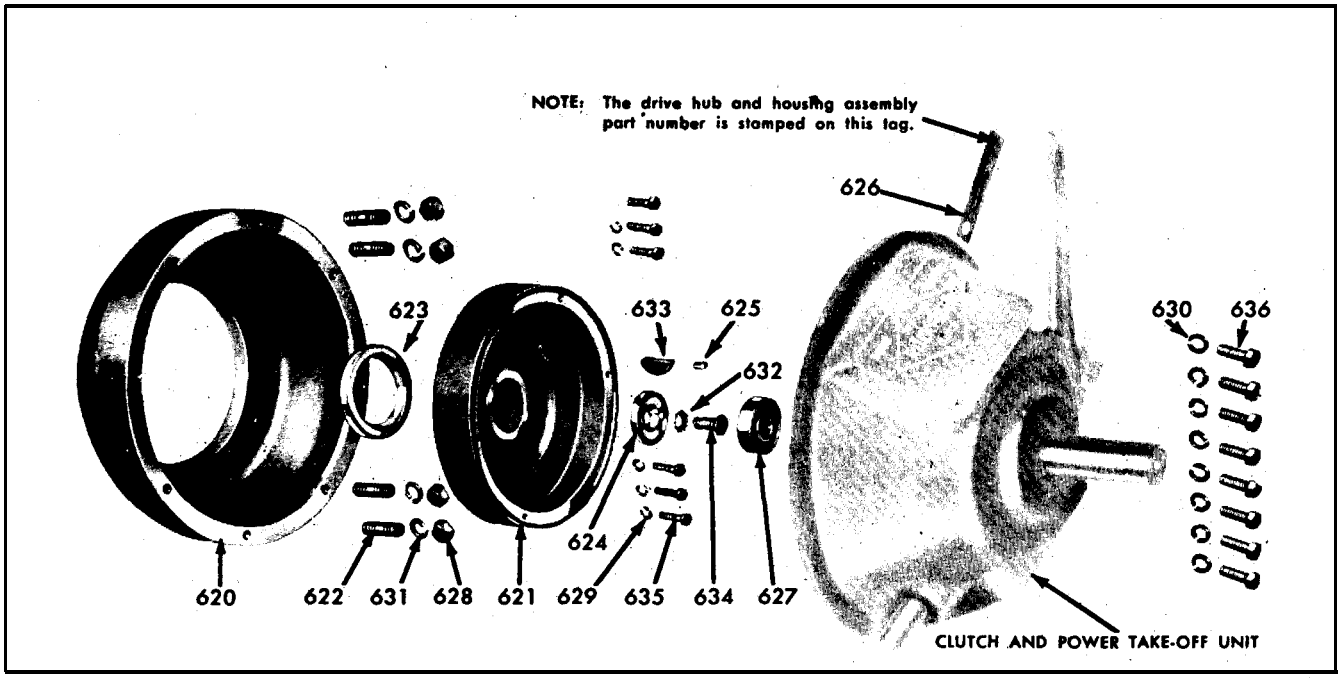
104568C-A 135518C-1

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
500	PD-173-A	**LOCKNUT** for adjusting screw	1		1
501	PI-145-1	**ADJUSTING SCREW**, 6-3/4" long	1		2
502	PK-121	**RETAINER** for adjusting screw spring	1		1
503	PM-111	**SPRING** for adjusting screw	1		1
504	TC-365-D	**PIN** for variable speed lever support	1		1
505	TC-368-A	**PIN** for adjusting screw swivel	1		1
506	VB-134-A	**VARIABLE SPEED LEVER**	1		4
507	VE-527-W	**CONTROL**	1		8
		STANDARD HARDWARE			
510	PE-3	**LOCKWASHER**, ¼" Positive For support pin.	1		1
511	PH-77	**PLAIN WASHER**, 5/16" I.D. x 5/8" O.D. x 1/16" thick steel For variable speed lever.	1		1
512	XA-62	**SCREW**, 8-32 thread x ¼" long, round head For cotter pin in lever.	1		1
513	XI-1	**COTTER PIN**, 1/16" x 1/2" long 1-for variable speed lever pin. 1-for adjusting screw spring. 1-for chain at control.	3		1
514	XI-11	**COTTER PIN**, 3/32" x 1¼" long For chain at lever.	1		1
515		**No. 1/0 GALVANIZED SAFETY CHAIN** 12" long. For control to lever.	1 pc		2

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
519	HF-417	**SPACER** for control bracket	1		1
520	PG-466	**BRACKET** for control lever	1		2
521	PI-147-B	**ADJUSTING SCREW**, 10½" long	1		2
522	TC-380	**FULCRUM PIN** for control lever	1		1
523	TC-381-1	**PIN** for adjusting screw	1		1
524	VB-142	**CONTROL LEVER**	1		4
		STANDARD HARDWARE			
527	PD-77	**NUT**, 1/4"-20 thread, hexagon steel For fulcrum pin.	1		1
528	PD-115	**NUT**, No. 10-32 thread, hexagon steel For adjusting screw.	2		1
529	PE-3	**LOCKWASHER**, 1/4" Positive 1-for fulcrum pin. 1-for bracket mounting.	2		1
531	XD-6	**SCREW**, 1/4"-20 thread x 3/4" long, hexagon head For bracket mounting.	1		1
532	XI-1	**COTTER PIN**, 1/16" x 1/2" long For adjusting screw pin.	1		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

WW-83 CLUTCH DRIVE HUB AND HOUSING ASSEMBLY
FOR ROCKFORD CLUTCH AND POWER TAKE-OFF UNIT ON MVG4D ENGINE



99749C

The Above Assembly is Suitable for Mounting the Following Clutch and Power Take-off Unit

WISCONSIN MOTOR Part Number	ROCKFORD Part Number	NET WEIGHT lbs	NET WEIGHT oz	
WC-302-B	PTA-5822	55		NOTE: See Rockford illustration and parts list of Clutch and Power Take-off Parts.

NOTE: Engines equipped e ith a Clutch and Power Take-off Unit require a special main bearing plate, crankshaft and crankcase as follows:

BG-194-B-S1 MAIN BEARING PLATE ASSEMBLY (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 CRANKSHAFT ASSEMBLY (not illustrated) Includes:
1 GA-35A-1 Gear
2 ME-98 Bearings
1 PL-49 Key
1 RK-173 Oil Slinger

CA-69-D-2-S1 on Mil-E-11275-B and -A spec engines. — For replacement use CA-69-E-2-S1.

THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.

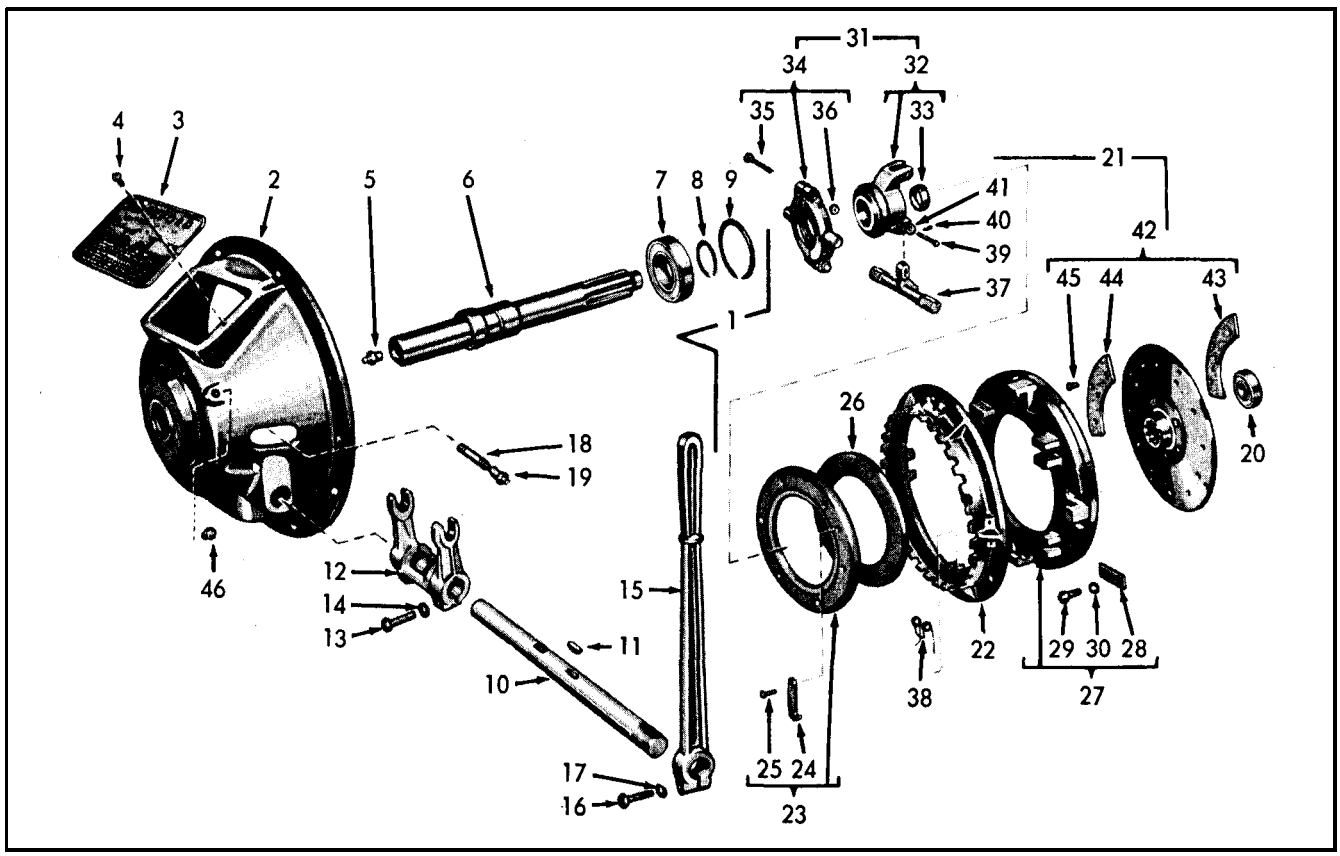
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WW-83	**DRIVE HUB** and **HOUSING ASSEMBLY**. Consisting of the following parts:		50	
620	BO-169B-2	**HOUSING** for drive hub (No. 5 S.A.E.) ..	1	29	8
621	NC-149	**DRIVE HUB**	1	18	
622	PC-287	**STUD** for housing to crankcase mounting	4		2
623	PH-278	**SEAL** for main bearing	1		3
624	PH-279	**RETAINER** for drive hub	1		3
625	QD-678	**CORK SEAL** for drive key hub.....	1		1
626	SD-79-B	**ASSEMBLY NUMBER TAG**	1		1
627	ME-190	**PILOT BEARING** (Furnished with clutch)	1		8
		STANDARD HARDWARE			
628	PD-15	**NUT**, 5/8"-18 thread, hexagon steel ..... For mounting housing to crankcase.	4		1

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
629	PE-4	**LOCKWASHER**, 5/16" Positive ..... For mounting clutch to drive hub.	6		1
630	PE-5	**LOCKWASHER**, 3/8" Positive ..... For mounting unit to housing.	8		1
631	PE-37	**LOCKWASHER**, 5/8" Positive ..... For mounting housing to crankcase.	4		1
632	PE-50	**LOCKWASHER**, 7/16" countersunk ..... For mounting hub retainer.	1		1
633	PL-122-1	**KEY**, No. 25 Woodruff ..... For mounting drive hub.	1		1
634	XC-22	**SCREW**, 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer	1		1
635	XD-17	**SCREW**, 5/16"-18 thread x 1" long, hexagon head ..... For mounting clutch to drive hub.	6		1
636	XD-27	**SCREW**, 3/8"-16 thread x 1" long, hexagon head ..... For mounting unit to housing.	8		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

WC-302-B CLUTCH AND POWER TAKE-OFF UNIT, ROCKFORD No. PTA-5822



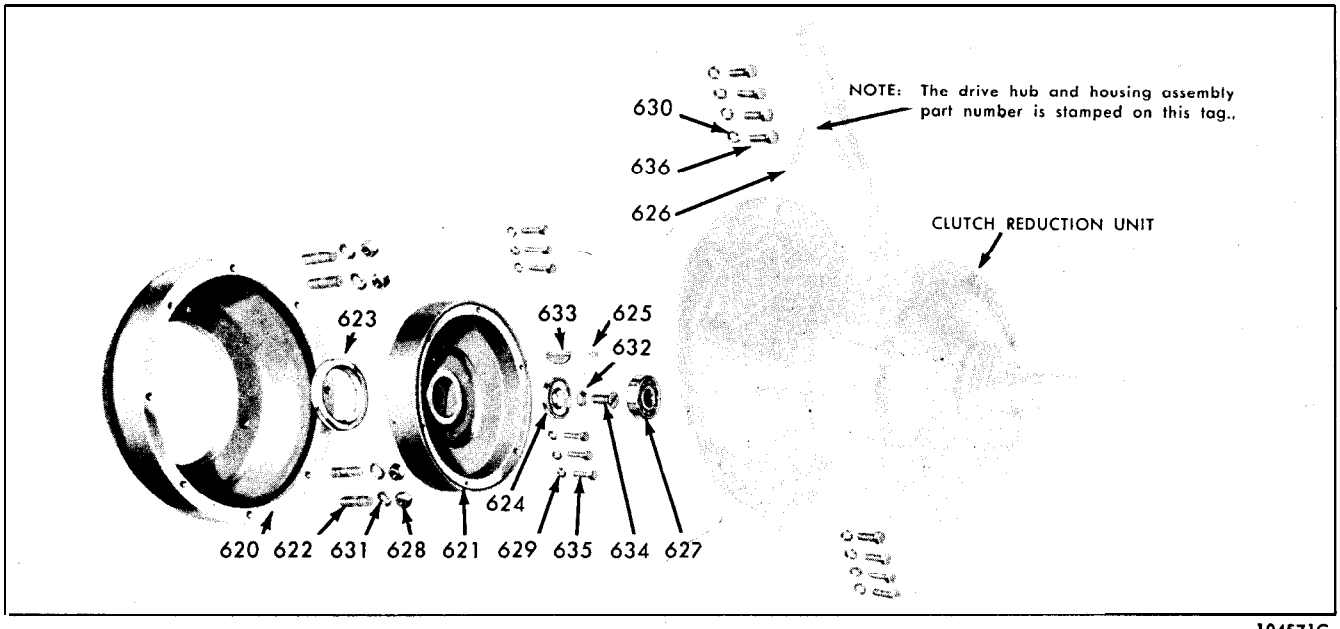
206585C-A

Ref. No.	Rockford Part Number	Description	No Req
1	PTA-5M30	**HOUSING** and **SHAFT ASSEMBLY** ..... Consisting of:	1
2	PT-969-28	**No. 5 S.A.E. HOUSING** (Rep'l. PT-969)	1
3	PT-1593	**INSTRUCTION PLATE** (Rep'l. PT-897)	1
	PT-770	**INSTRUCTION PLATE GASKET**	1
4	PT-347	**SCREW** for instruction plate, 1/4"-20 x 3/8" round head	2
5	PT-360	**ALEMITE FITTING,** No. 1610	1
6	UPT-684-3	**DRIVE SHAFT ASSEM.** (Incl. Ref. No. 5) ..... PT-684 replaced by UPT-684-3.	1
7	PT-972	**SHAFT BEARING,** Wis. Motor No. **ME-195**	1
8	PT-807	**SNAP RING** on shaft for bearing ..... PT-191 replaced by PT-807.	1
9	PT-938	**SNAP RING** in housing for bearing.....	1
10	PT-200	**SHIFTER SHAFT**.....	1
11	PT-351	**KEY** for shifter yoke, No. 15 Woodruff	2
12	UPT-199	**SHIFTER YOKE** (Incl. Ref. No's. 13, 14)	1
13	PT-352	**CLAMP SCREW** for yoke, 3/8"-16 x 1¼" hex.	2
14	PT-353	**LOCKWASHER** for yoke clamp screw, 3/8"....	2
15	UPT-769	**SHIFTING LEVER** (Incl. Ref. No's. 16, 17) ..	1
16	PT-604	**CLAMP SCREW** for shifting lever, 3/8"-16 x 1-1/2" hexagon	1
17	PT-353	**LOCKWASHER** for lever clamp screw, 3/8" .	1
18	PT-639	**PIPE NIPPLE** for Alemite fitting	1
19	PT-355	**ALEMITE FITTING** No. 1618	1
20	PT-395	**PILOT BEARING,** Wis. Motor No. **ME-190**.....	1
	CL-5452	**ALEMITE FITTING,** No. 1743 (Not illustrated) For shifter shaft lubrication.	2
21	CLA-1640-A	**CLUTCH ASSEMBLY** – Complete ..... (Ref. No. 22 to 45).	1
22	CL-2346	**BACK PLATE**.....	1
23	UCL-8681-1	**ADJUSTING RING ASSEMBLY** Includes:	1
24		CL-3154-1 Adjustment lock	1
25		CL-3452 Lock pin	1

Ref. NO.	Rockford Part Number	Description	No Req
26	CL-3448	**ADJUSTING RING PLATE**	1
27	UCL-2348-1	**PRESSURE PLATE ASSEMBLY** Includes:	1
28		CL-3352 Cam block	4
29		CL-3917 Screw, 1/4"-20 thread x 3/8" long, fillister head	4
30		CL-3468 Lockwasher, 1/4" Shakeproof	4
31	UCL-1-3444-A	**SLEEVE** and **BEARING ASSEMBLY**..... (Replaces UCL-3444-A) Consisting of:	1
32	UCL-3444	**SLEEVE ASSEMBLY** ..... Includes:	1
33		CL-3089 Bushing	2
34	UCL-2-3091	**RELEASE BEARING ASSEMBLY** ..... (Replaces UCL-1-3091). Includes:	1
35		CL-3443-1 Screw, 5/16"-24 thread x 1-5/8" long, hexagon.....	2
36		CL-7356 Elastic stop nut, 5/16"-24 thread.	2
37	UCL-4281	**CAMSHAFT ASSEMBLY**	2
38	CL-2326	**RETURN SPRING**	4
39	CL-2355	**LEVER PIN**	2
40	CL-487	**COTTER PIN** for lever pin, 3/32" x 1/2" long	2
41	CL-4701	**WASHER** for lever pin, 3/16" I.D.	2
42	UCL-7-1191-3	**DRIVEN MEMBER ASSEMBLY** Includes:	1
43		CL-4491-43 Facing (Rep'l. (4) CL-1418)	1
44		CL-4491-43 Facing (Rep'l. (4) CL-1419)	1
45		CL-1011 Tubular rivet.....	12
46	PT-668	**ALEMITE FITTING, No. 1930**.....	1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

WW-83 CLUTCH DRIVE HUB AND HOUSING ASSEMBLY FOR ROCKFORD CLUTCH REDUCTION UNITS ON MVG4D ENGINE



104571C

The Above Assembly is Suitable for Mounting the Following Clutch Reduction Units

Wisconsin Motor Part Number	Rockford Part Number	Reduction Ratio	Rotation at Take-Off Shaft	Net Weight lbs	Net Weight oz	
WC-314	GRA-586	2.05 to 1	Counter-Enginewise	80		**NOTE:** See Rockford illustration and parts list for Clutch Reduction Unit Parts.
WC-315	GRA-589	2.50 to 1	Counter-Enginewise	82		
WC-316	GRA-584	3.90 to 1	Counter-Enginewise	85		

NOTE: Engines equipped with a Clutch Reduction Unit require a special main bearing plate, crankshaft and crankcase as follows:

G-194-B-S1 MAIN BEARING PLATE ASSEMBLY (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 CRANKSHAFT ASSEMBLY (not illustrated) Includes:
1 GA-35A-1 Gear
2 ME-98 Bearings
1 PL-49 Key
1 RK-173 Oil Slinger

CA-69-D-2-S1 on MIL-E-11275-B and -A spec engines. — For replacement use CA-69-E-2-S1.

THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.

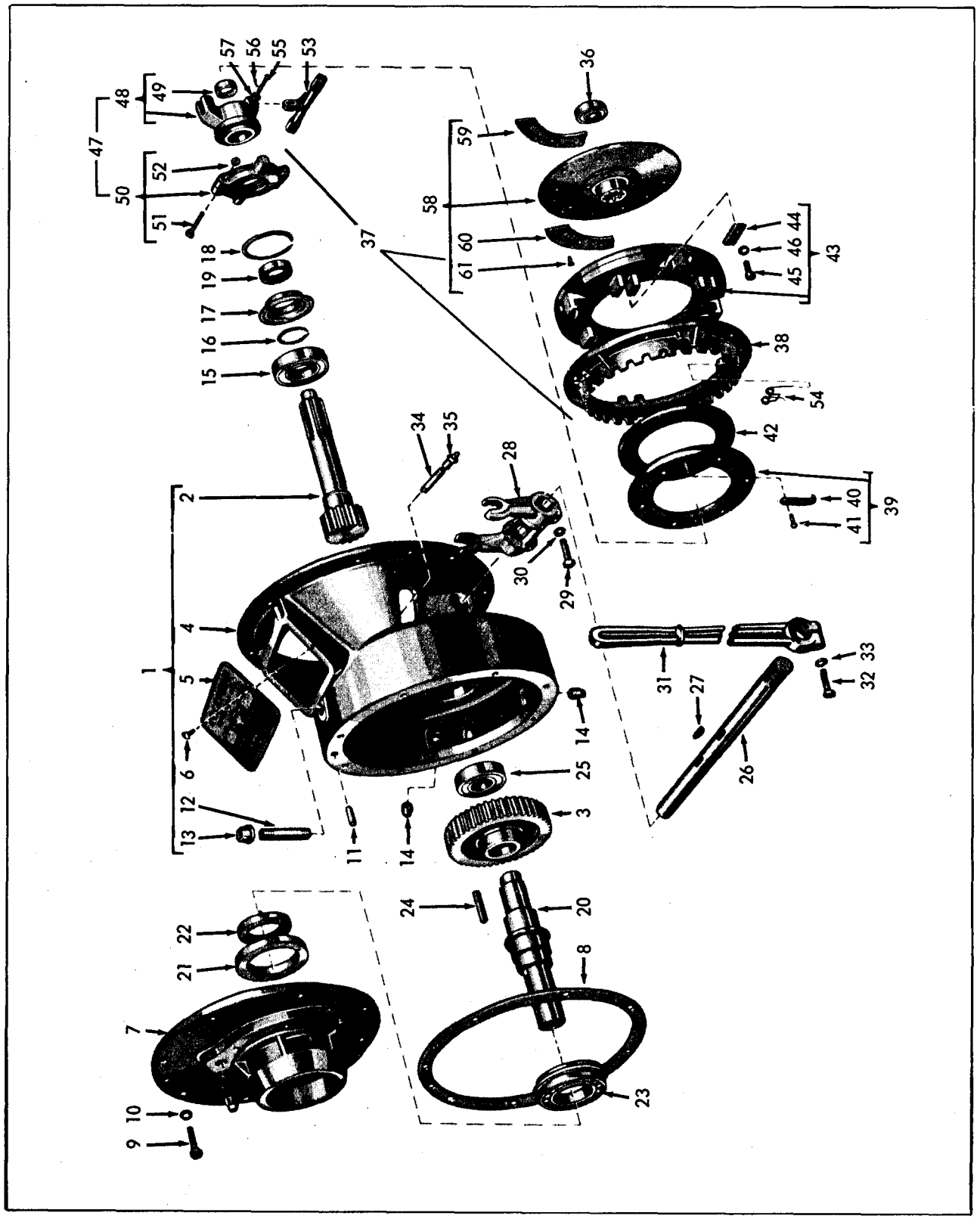
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WW-83	**DRIVE HUB and HOUSING ASSEMBLY..** Consisting of the following parts:			
620	**BO-169B-2**	**HOUSING** for drive hub (No. 5 S.A.E.)..	1	29	8
621	**NC-149**	**DRIVE HUB**.....	1	18	
622	**PC-287**	**STUD** for housing to crankcase mounting	4		2
623	**PH-278**	**SEAL** for main bearing	1		3
624	**PH-279**	**RETAINER** for drive hub.....	1		3
625	**QD-678**	**CORK SEAL** for drive hub key	1		1
626	**SD-79-B**	**ASSEMBLY NUMBER TAG**	1		1
627	**ME-190**	**PILOT BEARING** (Furnished with clutch)	1		8
		STANDARD HARDWARE			
628	**PD-15**	**NUT,** 5/8"-18 thread, hexagon steel ..... For mounting housing to crankcase.	4		1
629	**PE-4**	**LOCKWASHER,** 5/16" Positive ..... For mounting clutch to drive hub.	6		1

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
630	**PE-5**	**LOCKWASHER,** 3/8" Positive..... For mounting unit to housing.	8		1
631	**PE-37**	**LOCKWASHER,** 5/8" Positive..... For mounting housing to crankcase.	4		1
632	**PE-50**	**LOCKWASHER,** 7/16" countersunk ..... For mounting hub retainer.	1		1
633	**PL-122-1**	**KEY,** No. 25 Woodruff ..... For mounting drive hub.	1		1
634	**KC-22**	**SCREW,** 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer	1		1
635	**KD-17**	**SCREW,** 5/16"-18 thread x 1" long, hexagon head ..... For mounting clutch to drive hub.	6		1
636	**KD-27**	**SCREW,** 3/8"-16 thread x 1" long, hexagon head..... For mounting unit to housing.	8		1

REDUCTION UNIT ASSEMBLIES

Wisconsin Motor No's. WC-314, WC-315, WC-316

Rockford Part Numbers GRA-586, GRA-589, GRA-584



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Parts are identified by reference number. See parts list for correct part number.

REDUCTION UNIT ASSEMBLIES

ROCKFORD PART NO.	WISCONSIN MOTOR PART NUMBER	REDUCTION RATIO
GRA-586	WC-314	2.05 to 1
GRA-589	WC-315	2.50 to 1
GRA-584	WC-316	3.90 to 1

Rockford Assembly No.	REF. No. 1 Housing Assembly Incl. Ref. No. 2 to 36	REF. No. 2 Drive Shaft and Gear	REF. No. 3 Driven Gear
GRA-586	GRA-5M6	GR - 103 (21 teeth)	GR - 102 (43 teeth)
GRA-589	GRA-5M7	GR - 122 (18 teeth)	GR - 108 (46 teeth)
GRA-584	GRA-5M4	GR - 109 (13 teeth)	GR - 110 (51 teeth)

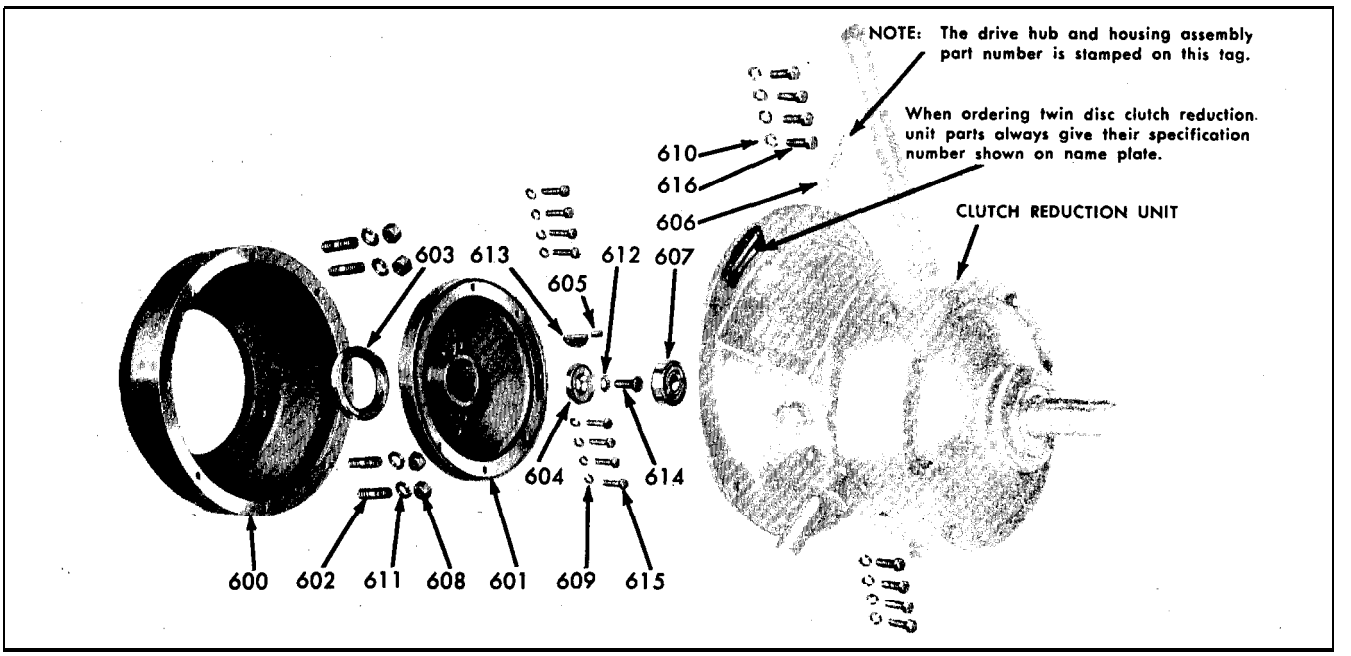
THE FOLLOWING PARTS ARE IDENTICAL FOR ALL THE ABOVE ASSEMBLIES

Ref. No.	Rockford Part Number	Description	No Req
4	GR-100	**No. 5 S.A.E. HOUSING**	1
5	PT-1593	**INSTRUCTION PLATE** (Rep'l. PT-897)	1
6	PT-347	**SCREW** for instruction plate, 1/4"-20 x 3/8" round head	2
7	GR-101	**HOUSING COVER**	1
8	GR-111	**GASKET** for housing cover	1
9	PT-469	**SCREW** for housing cover, 3/8"-16 x 1" hexagon head	8
10	PT-353	**LOCKWASHER** for cover screw, 3/8" Positive	8
11	GR-114	**DOWEL PIN** for cover, 3/8" x 1" long	1
12	GR-753	**PIPE NIPPLE** for oil filler, 3/8"	1
13	GR-236	**PIPE CAP** for oil filler, 3/8"	1
14	GR-117	**PIPE PLUG** for oil level and drain, 3/8"	3
15	PT-888	**BEARING** for drive shaft Wisconsin Motor No. **ME-194.**	1
16	PT-189	**SNAP RING** on shaft for bearing	1
17	GR-123	**SEAL RETAINER**	1
18	PT-192	**SNAP RING** in housing for bearing	1
19	GR-118	**OIL SEAL,** Perfect No. 20018	1
20	GR-104	**TAKE-OFF SHAFT**	1
21	GR-105	**SEAL RETAINER**	1
22	GR-119	**OIL SEAL,** Perfect No. 2992	1
23	GR-120	**BEARING** for take-off shaft Wisconsin Motor No. **ME-197.**	1
24	GR-106	**KEY** for driven gear	1
25	GR-121	**BEARING** for take-off shaft Wisconsin Motor No. **ME-198.**	1
26	PT-200	**SHIFTER SHAFT**	1
27	PT-351	**KEY** for shifter yoke, No. 15 Woodruff	2
28	PT-199	**SHIFTER YOKE**	1
29	PT-352	**CLAMP SCREW** for yoke, 3/8"-16 x 1¼" hex.	2
30	PT-353	**LOCKWASHER** for yoke clamp screw, 3/8"	2
31	PT-769	**SHIFTING LEVER**	1
32	PT-604	**CLAMP SCREW** for shifting lever, 3/8"-16 x 1-1/2" hexagon	1

Ref. No.	Rockford Part Number	Description	No Req
33	PT-353	**LOCKWASHER** for lever clamp screw, 3/8"	1
34	PT-639	**PIPE NIPPLE** for Alemite fitting	1
35	PT-355	**ALEMITE FITTING,** No. 1618	1
36	PT-395	**PILOT BEARING,** Wis. Motor No. **ME-190**	1
37	CLA-1640-A	**CLUTCH ASSEMBLY COMPLETE** (Ref. No. 38 to 61)	1
38	CL-2346	**BACK PLATE**	1
39	UCL-8681-1	**ADJUSTING RING ASSEMBLY** Includes:	1
40		CL-3154-1 Adjustment lock	1
41		CL-3452 Lock pin	1
42	CL-3448	**ADJUSTING RING PLATE**	1
43	UCL-2348-1	**PRESSURE PLATE ASSEMBLY** Includes:	1
44		CL-3352 Cam block	4
45		CL-3917 Screw, 1/4"-20 thread x 3/8" long, fillister head	4
46		CL-3468 Lockwasher, 1/4" Shakeproof	4
47	UCL-1-3444-A	**SLEEVE** and **BEARING ASSEMBLY** (Replaces UCL-3444-A) Consisting of:	1
48	UCL-3444	**SLEEVE ASSEMBLY** Includes:	1
49		CL-3089 Bushing	2
50	UCL-2-3091	**RELEASE BEARING ASSEMBLY** (Replaces UCL-1-3091) Includes:	1
51		CL-3443-1 Screw, 5/16"-24 thread x 1-5/8" long, hexagon	2
52		CL-7356 Elastic stop nut, 5/16"-24 thread	2
53	UCL-4281	**CAM SHAFT ASSEMBLY**	2
54	CL-2326-1	**RETURN SPRING**	4
55	CL-2355	**LEVER PIN**	2
56	CL-487	**COTTER PIN** for lever pin, 3/32" x 1/2" long	2
57	CL-4701	**WASHER** for lever pin	2
58	UCL-7-1191-3	**DRIVEN MEMBER ASSEMBLY** Includes:	1
59		CL-4491-43 Facing (Rep'l. (4) CL-1418)	1
60		CL-4491-43 Facing (Rep'l. (4) CL-1419)	1
61		CL-1011 Tubular rivet	12
		CL-1830 Oil deflector	1
		CL-486 Rivet	6

Order parts from nearest *SERVICE STATION* shown in directory following parts list.
IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

WW-80 DRIVE HUB AND HOUSING ASSEMBLY FOR TWIN DISC CLUTCH REDUCTION UNITS ON MVG4D ENGINE



99748C

The Above Assembly is Suitable for Mounting the Following Clutch Reduction Units

Wisconsin Motor Part Number	Twin Disc C-7-1/2, Model	Twin Disc Drawing No.	Reduction Ratio	Rotation at Take-Off Shaft	Net Weight lbs	Net Weight oz
WC-249-1	C107E2RG5	X 8515	2.56 to 1	Engine-wise	89	
WC-250-1	C107E3RG5	X 8515	3.60 to 1	Engine-wise	90	
WC-251-1	C107E5RG5	X 8516	4.90 to 1	Engine-wise	92	
WC-252-1	C107A2RG5	X 8518	2.50 to 1	Counter-enginewise	83	
WC-253-1	C107A4RG5	X 8518	3.90 to 1	Counter-enginewise	85	

NOTE: See Twin Disc illustration and parts list for clutch reduction unit parts. Always give their specification, number shown on name plate, when ordering parts.

NOTE: Engines equipped with a Clutch Reduction Unit require a special main bearing plate, crankshaft and crankcase as follows:

BG-194-B-S1 MAIN BEARING PLATE ASSEMBLY (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 CRANKSHAFT ASSEMBLY (not illustrated) Includes:
1 GA-35-A-1 Gear
1 PL-49 Key
2 ME-98 Bearings
1 RK-173 Oil Slinger

CA-69-D-2-S1 on MIL-E-11275-B and -A spec engines. — For replacement use CA-69-E-2-S1.

THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.

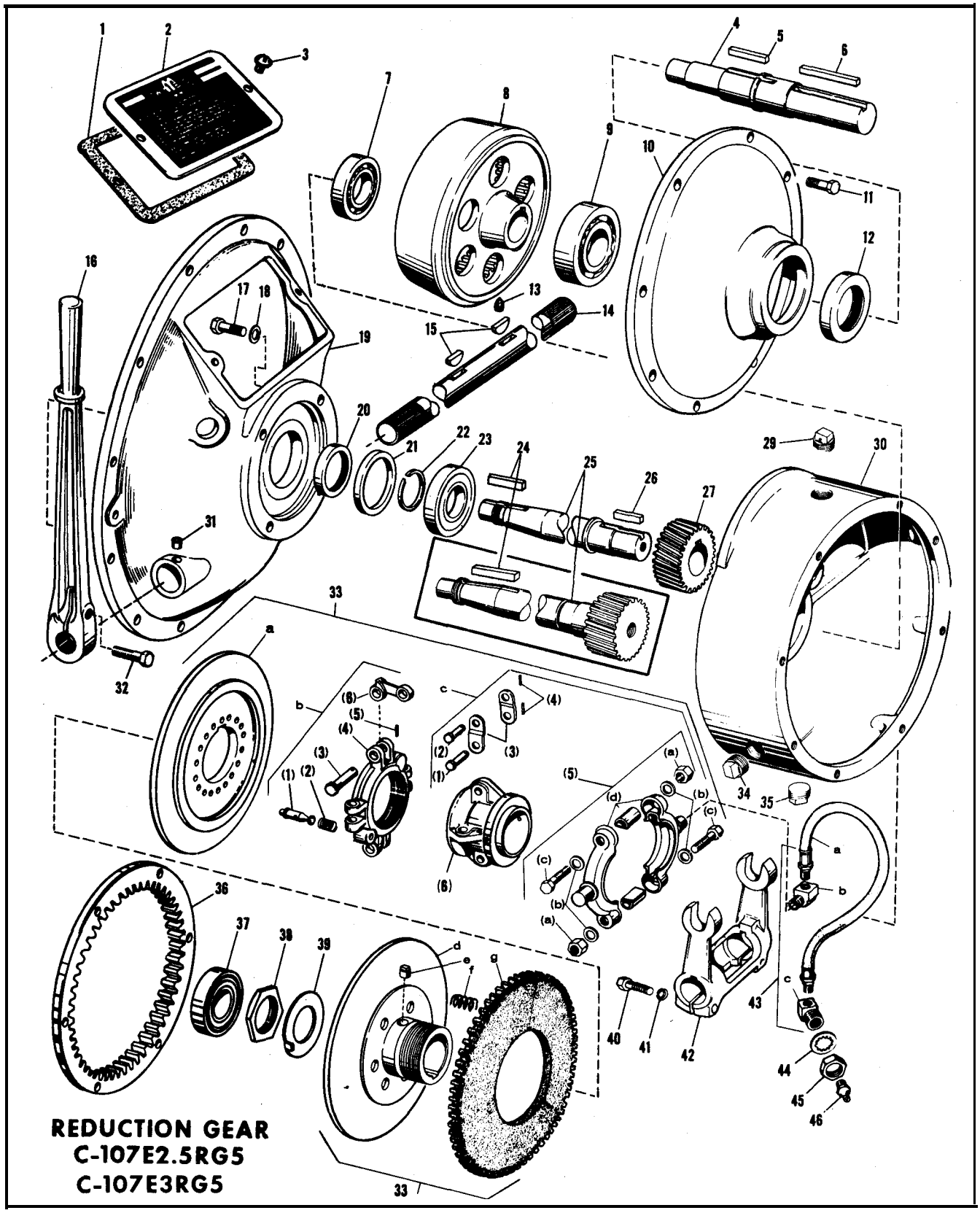
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WW-80	**DRIVE HUB and HOUSING ASSEMBLY..** Consisting of the following parts:			
600	BO-169-B-2	**HOUSING** for drive hub (No. 5 S.A.E.) ..	1	29	8
601	NC-135A-1	**DRIVE HUB**	1	13	
602	PC-287	**STUD** for housing to crankcase mounting	4		2
603	PH-278	**SEAL** for main bearing	1		3
604	PH-279	**RETAINER** for drive hub	1		3
605	QD-678	**CORK SEAL** for drive hub key	1		1
606	SD-79-B	**ASSEMBLY NUMBER TAG**.....	1		1
607		**Strom** No. 205F pilot bearing ..... (Furnished with clutch)	1		8
		STANDARD HARDWARE			
608	PD-15	**NUT,** 5/8"-18 thread, hexagon steel..... For mounting housing to crankcase.	4		1
609	PE-4	**LOCKWASHER,** 5/16" Positive..... For mounting clutch to drive hub.	8		1
610	PE-5	**LOCKWASHER,** 3/8" Positive ..... For mounting unit to housing.	8		1
611	PE-37	**LOCKWASHER,** 5/8" Positive ..... For mounting housing to crankcase.	4		1
612	PE-50	**LOCKWASHER,** 1/16" countersunk ..... For mounting hub retainer.	1		1
613	PL-122-1	**KEY,** No. 25 Woodruff ..... For mounting drive hub.	1		1
614	(C-22	**SCREW,** 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer.....	1		1
615	(D-19	**SCREW,** 5/16"-18 thread x 1-1/4" long, hexagon head ..... For mounting clutch to drive hub.	8		1
616	(D-27	**SCREW,** 3/8"-16 thread x 1" long, hexagon head ..... For mounting unit to housing.	8		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NOs. C107E2.5RG5 and C107E3RG 5
WISCONSIN MOTOR PART NOs. WC-249.1 and WC-250-1
ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY



Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C-107-E2.5-RG5, SPEC. 15356	WC-249- 1	2.56 to 1	Engine-wise
C-107-E3-RG5, SPEC. 15619	WC-250- 1	3.60 to 1	Engine-wise

PARTS LIST

ALL PARTS ARE INTERCHANGEABLE ON THE ABOVE TWIN DISC CLUTCH REDUCTION UNITS, EXCEPT WHERE NOTED.

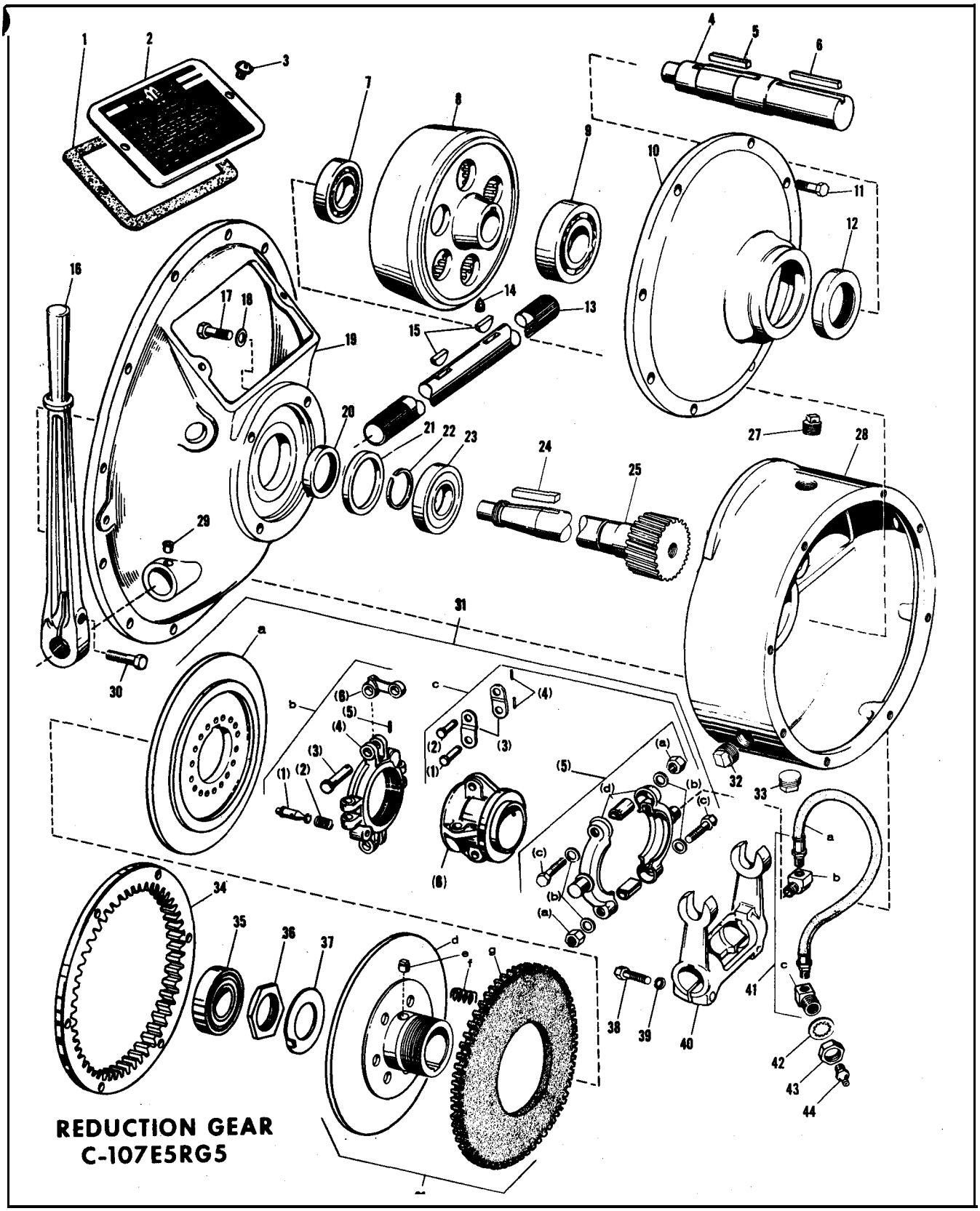
Ref. No.	Twin Disc Part Number	Description	No Req
1	A1339	GASKET, plate, specification	1
2	1965R	PLATE, specification	1
3	M2023F	SCREW, cap, button-head, 1/4-20 x 1/2	2
4	A3093	SHAFT, counter	1
5	M2032AY	KEY, 3/8 x 3/8 x 1-1/2	1
6	M2032BH	KEY, 3/8 x 3/8 x 3-1/4	1
7	M1586	BALL BEARING (5204-SBK)	1
8	6381A	DRIVEN GEAR, internal (for WC-249-1 only) 2.56:1 reduction	1
	6984	DRIVEN GEAR, internal (for WC-250-1 only) 3.60:1 reduction	1
9	M174	BALL BEARING (308-M)	1
10	6974	PLATE, cover	1
11	M2001M	SCREW, cap, hex-head, 5/16-18 x 7/8	8
12	M417	SEAL, oil, shaft, counter	1
13	M2039E	SETSCREW, half-dog-point, 1/2-13 x 5/8	1
14	2757	SHAFT, operating	1
15	M2022V	KEY, Woodruff	2
16	3799	LEVER, hand	1
17	M2006H	SCREW, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	WASHER, lock, 5/8-inch	4
19	7611	HOUSING, clutch, No. 5 S.A.E.	1
20	M105	SEAL, oil, shaft, clutch	1
21	2909	SPACER	1
22	2923	RING, snap	1
23	M144	BALL BEARING (207-MF)	1
24	M2032X	KEY, 1/4 x 1/4 x 1-7/8	1
25	A3094	SHAFT, clutch (for WC-249-1 only) 2.56:1 reduction	1
	A3095	CLUTCH SHAFT and GEAR (for WC-250-1 only) 3.60:1 reduction	1
26	M2032AL	GEAR KEY, 5/16 x 5/16 x 1-1/8 (for WC-249-1 only)	1
27	2944A	DRIVE GEAR, clutch (for WC-249-1 only) 2.56:1 reduction	1
29	1340A	PIPE PLUG, breather, oil	1
30	6378D	HOUSING, gear	1
31	M102	CUP, oil	2
32	M2004R	SCREW, cap, hex-head, 1/2-13 x 1-3/4	1
33	XA5060	CLUTCH, assembly, Model C-107	1
a	A3087	PLATE, floating	1
b	A-16	YOKE, adjusting, assembly	1
(1)	2042	PIN, lock, adjusting	1
(2)	1382	SPRING, pin, lock, adjusting	1
(3)	B1527A	PIN, lever, finger	4
		1871A pins and M642 snap rings, replaced by B1527A and M1927AS.	
(4)	3206	YOKE, adjusting	1
(5)	M1927AS	PIN, roll	4
(6)	2411	LEVER, finger	4
c	S-387	SLEEVE, sliding, assembly	1
(1)	B1527C	PIN, link, lever	4
		2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	
(2)	B1527B	PIN, link, lever	4
		1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	
(3)	2968	LINK, lever	8
(4)	M1927AS	PIN, roll	8
(5)	X117C8S	COLLAR, split, assembly	1
(a)	M1930F	NUT, hex, 3/8-24	2
(b)	1395A	WASHER, plain, 3/8-inch	4
(c)	M2002AS	SCREW, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	COLLAR, split (not serviced separately)	1
(6)	2969	SLEEVE, sliding, assembly	1
d	A3088	PLATE, hub-and-back	1
e	110D3	PIN, hub-and-back	1
f	A2286	SPRING, release	6
g	A5436S	PLATE, driving	1
34	M2051X	OIL LEVEL PLUG, square-head, ½-inch pipe	1
35	M2051X	OIL DRAIN PLUG, square-head, ½-inch pipe	1
36	6661	RING, driving	1
37	M141	BALL BEARING, pilot (205 SF)	1
38	2727	NUT, hub	1
39	A1587	WASHER, lock	1
40	M2002AG	SCREW, cap, hex-head, 3/8-16 x 1-1/2	2
41	M2046S	WASHER, lock, 3/8-inch	2
42	1037	FORK, throwout	1
43	A1663	HOSE, flexible, assembly	1
a	M1292A	HOSE, flexible	1
b	M1284	FITTING, 90-degree	1
c	M1283	FITTING, straight	1
44	M2046AF	WASHER, lock, 5/8-inch	1
45	M2027AN	NUT, jam, 5/8-18	1
46	M268	FITTING, hydraulic, 1/8-inch	1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLY

TWIN DISC PART NO. C107E5RG5 WISCONSIN MOTOR PART NO. WC-251-1

ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY



Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLY

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C-107-E5-RG5, SPEC. 15759	WC-251-1	4.90 to 1	Engine-wise

PARTS LIST

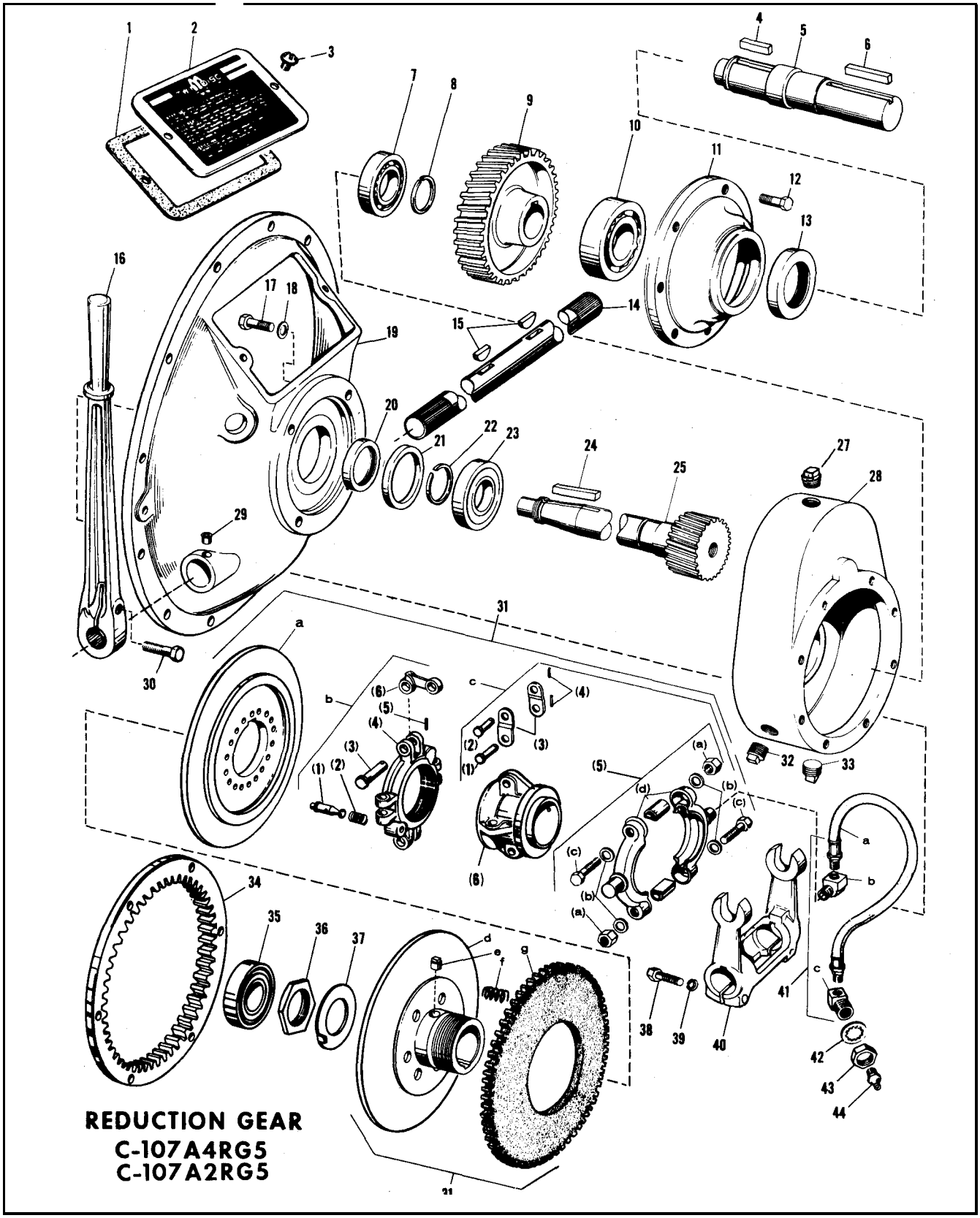
Ref No	Twin Disc Part Number	Description	No Req
1	A1339	GASKET, plate, specification	1
2	1965R	PLATE, specification	1
3	M2023F	SCREW, cap, button-head, 1/4-20 x 1/2	2
4	A3098	SHAFT, counter	1
5	M2032AY	KEY, 3/8 x 3/8 x 1-1/2	1
6	M2033B	KEY, 7/16 x 7/16 x 2-7/8	1
7	M166	BALL BEARING (306-M)	1
8	6381A	DRIVEN GEAR, internal	1
9	M178	BALL BEARING (309-M)	1
10	6981	PLATE, cover	1
11	M2001M	SCREW, cap, hex-head, 5/16-18 x 7/8	8
12	M605	SEAL, oil, shaft, counter	1
13	2757	SHAFT, operating	1
14	M2039E	SETSCREW, half-dog-point, 1/2-13 x 5/8	1
15	M2022V	KEY, Woodruff	2
16	3799	LEVER, hand	1
17	M2006H	SCREW, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	WASHER, lock, 5/8-inch	4
19	7611	HOUSING, clutch, No. 5 S.A.E.	1
20	M105	SEAL, oil, shaft, clutch	1
21	2909	SPACER	1
22	2923	RING, snap	1
23	M144	BALL BEARING (207-MF)	1
24	M2032X	KEY, 1/4 x 1/4 x 1-7/8	1
25	A3097	CLUTCH SHAFT and GEAR	1
27	1340A	PIPE PLUG, breather, oil	1
28	6406A	HOUSING, gear	1
29	M102	CUP, oil	2
30	M2004R	SCREW, cap, hex-head, 1/2-13 x 1-3/4	1
31	XA5060	CLUTCH, assembly, Model C-107	1
a	A3087	PLATE, floating	1
b	A-16	YOKE, adjusting, assembly	1
(1)	2042	PIN, lock, adjusting	1
(2)	1382	SPRING, pin, lock, adjusting	1
(3)	B1527A	PIN, lever, finger 1871A Pins and M642 snap rings, replaced by B1527A and M1927AS.	4
(4)	3206	YOKE, adjusting	1
(5)	M1927AS	PIN, roll	4
(6)	2411	LEVER, finger	4
c	S-387	SLEEVE, sliding, assembly	1
(1)	B1527C	PIN, link, lever 2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	4
(2)	B1527B	PIN, link, lever 1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	4
(3)	2968	LINK, lever	8
(4)	M1927AS	PIN, roll	8
(5)	X117C8S	COLLAR, split, assembly	1
(a)	M1930F	NUT, hex, 3/8-24	2
(b)	1395A	WASHER, plain, 3/8-inch	4
(c)	M2002AS	SCREW, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	COLLAR, split (not serviced separately)	1
(6)	2969	SLEEVE, sliding, assembly	1
d	A3088	PLATE, hub-and-back	1
e	110D3	PIN, hub-and-back	1
f	A2286	SPRING, release	6
g	A5436S	PLATE, driving	1
32	M2051X	OIL LEVEL PLUG, square-head, ½-inch pipe	1
33	M2051X	OIL DRAIN PLUG, square-head, ½-inch pipe	1
34	6661	RING, driving	1
35	M141	BALL BEARING, pilot (205-SF)	1
36	2727	NUT, hub	1
37	A1587	WASHER, lock	1
38	M2002AG	SCREW, cap, hex-head, 3/8-16 x 1-1/2	2
39	M2046S	WASHER, lock, 3/8-inch	2
40	1037	FORK, throwout	1
41	A1663	HOSE, flexible, assembly	1
a	M1292A	HOSE, flexible	1
b	M1284	FITTING, 90-degree	1
c	M1283	FITTING, straight	1
42	M2046AF	WASHER, lock, 5/8-inch	1
43	M2027AN	NUT, jam, 5/8-18	1
44	M268	FITTING, hydraulic, 1/8-inch	1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NOs. C107A2RG5 and C107A4RG5
WISCONSIN MOTOR PART NOs. WC-252-1 and WC-253-1

ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY



Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C107-A2-RG5, SPEC. 15516	WC-252-1	2.50 to 1	Counter-enginewise
C-107-A4-RG5, SPEC. 15748	WC-253-1	3.90 to 1	Counter-enginewise

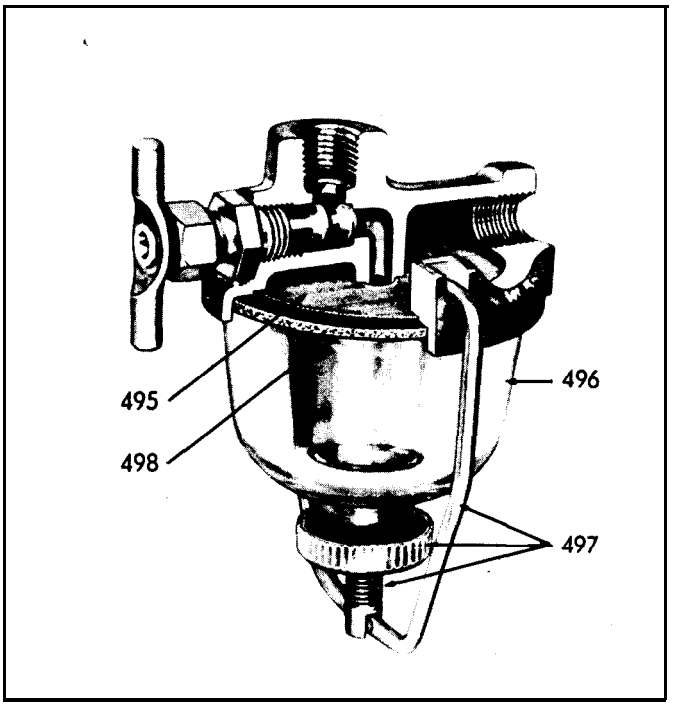
PARTS LIST

ALL PARTS ARE 'INTERCHANGEABLE ON THE ABOVE TWIN DISC CLUTCH REDUCTION UNITS, EXCEPT WHERE NOTED.

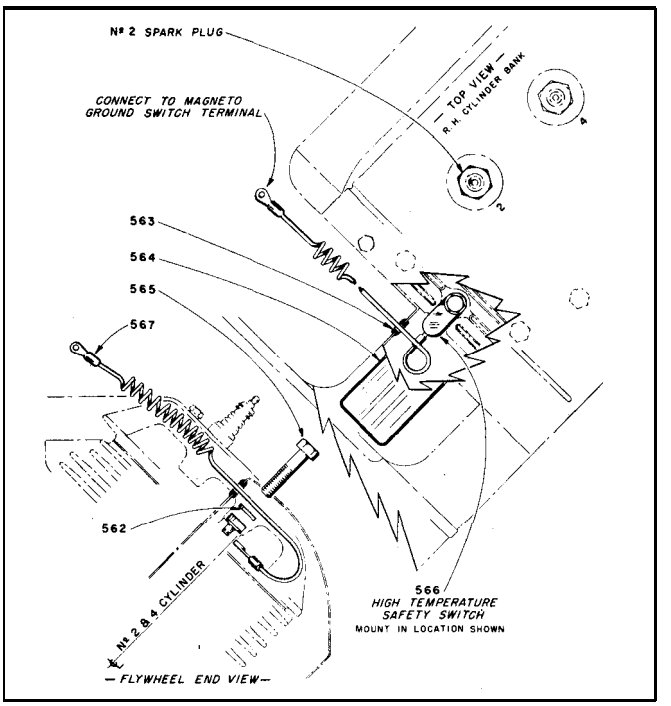
Ref No	Twin Disc Part Number	Description	No Req
1	A1339	**GASKET**, plate, specification	1
2	1965R	**PLATE**, specification	1
3	M2023F	**SCREW**, cap, button-head, 1/4-20 x 1/2	2
4	M2032BC	**KEY**, 3/8 x 3/8 x 2	1
5	A3110	**SHAFT**, counter	1
6	M2032BE	**KEY**, 3/8 x 3/8 x 2-1/2	1
7	M143	**BALL BEARING**	1
8	A1358	**RING**, snap	1
9	A3108	**GEAR** (for WC-252-1 only) 2.5:1 reduction	1
	A3109	**GEAR** (for WC-253-1 only) 3.9:1 reduction	1
10	M174	**BALL BEARING** (308-M)	1
11	6997	**PLATE**, cover	1
12	M2001M	**SCREW**, cap, hex-head, 5/16-18 x 7/8	8
13	M417	**SEAL**, oil, shaft, counter	1
14	2757	**SHAFT**, operating	1
15	M2022V	**KEY**, Woodruff	2
16	3799	**LEVER**, hand	1
17	M2006H	**SCREW**, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	**WASHER**, lock, 5/8-inch	4
19	7611	**HOUSING**, clutch, No. 5 S.A.E.	1
20	M105	**SEAL**, oil, shaft, clutch	1
21	2909	**SPACER**	1
22	2923	**RING**, snap	1
23	M144	**BALL BEARING** (207-MF)	1
24	M2032X	**KEY**, 1/4 x 1/4 x 1-7/8	1
25	A3111	**CLUTCH SHAFT** and **PINION** (for WC-252-1 only) 2.5:1 reduction	1
	A3097	**CLUTCH SHAFT** and **PINION** (for WC-253-1 only) 3.9:1 reduction	1
27	1340A	**PIPE PLUG**, breather, oil	1
28	8528	**HOUSING**, gear	1
29	M102	**CUP**, oil	2
30	M2004R	**SCREW**, cap, hex-head, 1/2-13 x 1-3/4	1
31	XA5060	**CLUTCH**, assembly, Model C-107	1
a	A3087	**PLATE**, floating	1
	A-16	**YOKE**, adjusting, assembly	1
(1)	2042	**PIN**, lock, adjusting	1
(2)	1382	**SPRING**, pin, lock, adjusting	1
(3)	B1527A	**PIN**, lever, finger	4
		1871A pins and M642 snap rings, replaced by B1527A and M1927AS.	
(4)	3206	**YOKE**, adjusting	1
(5)	M1927AS	**PIN**, roll	4
(6)	2411	**LEVER**, finger	4
C	S-387	**SLEEVE**, sliding, assembly	1
(1)	B1527C	**PIN**, link, lever	4
		2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	
(2)	B1527B	**PIN**, link, lever	4
		1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	
(3)	2968	**LINK**, lever	8
(4)	M1927AS	**PIN**, roll	8
(5)	X117C8S	**COLLAR**, split, assembly	1
(a)	M1930F	**NUT**, hex, 3/8-24	2
(b)	1395A	**WASHER**, plain, 3/8-inch	4
(c)	M2002AS	**SCREW**, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	**COLLAR**, split (not serviced separately)	1
(6)	2969	**SLEEVE**, sliding, assembly	1
d	A3088	**PLATE**, hub-and-back	1
e	110D3	**PIN**, hub-and-back	1
f	A2286	**SPRING**, release	6
g	A5436S	**PLATE**, driving	1
32	M2051X	**OIL LEVEL PLUG**, square-head, ½-inch pipe	1
33	M2051X	**OIL DRAIN PLUG**, square-head, ½-inch pipe	1
34	6661	**RING**, driving	1
35	M141	**BALL BEARING**, pilot (205-SF)	1
36	2727	**NUT**, hub	1
37	A1587	**WASHER**, lock	1
38	M2002AG	**SCREW**, cap, hex-head, 3/8-16 x 1-1/2	2
39	M2046S	**WASHER**, lock, 3/8-inch	2
40	1037	**FORK**, throwout	1
41	A1663	**HOSE**, flexible, assembly	1
a	M1292A	**HOSE**, flexible	1
b	M1284	**FITTING**, 90-degree	1
c	M1283	**FITTING**, straight	1
42	M2046AF	**WASHER**, lock, 5/8-inch	1
43	M2027AN	**NUT**, jam, 5/8-18	1
44	M268	**FITTING**, hydraulic, 1/8-inch	1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.
IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

FUEL STRAINER ASSEMBLIES



YC-66-D-S1 HIGH TEMP SAFETY SWITCH KIT FOR MVG4D ENGINE



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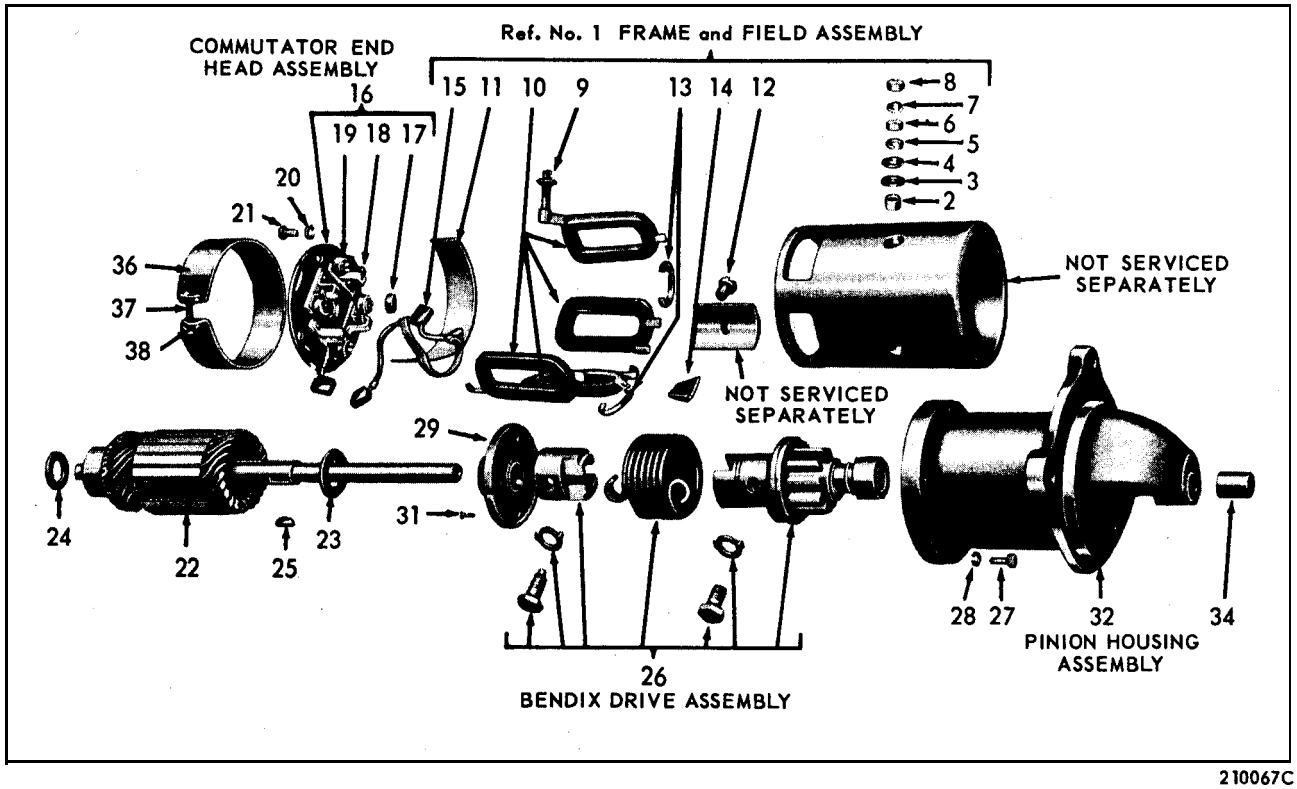
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	LP-19	**FUEL STRAINER ASSEMBLY**..... (With Shut-off valve in cover, and glass bowl) Tillotson No. OW-418-T.	1		8
	LP-19-A	**FUEL STRAINER ASSEMBLY**..... (With Shut-off valve in cover, and metal bowl) Tillotson No. OW-449-T.	1		7
	LP-19-B	**FUEL STRAINER ASSEMBLY**..... (Without Shut-off valve in cover, and glass bowl) Tillotson No. OW-444.	1		6
	LP-19-C	**FUEL STRAINER ASSEMBLY**..... (Without Shut-off valve in cover, and metal bowl) Tillotson No. OW-476-T.	1		5
		The following serviceable parts are interchangeable for all the above fuel strainers.			
583	OW-352	**FILTER SCREEN**	1		1
584	OW-363	**GLASS BOWL**	1		2
	06137	**METAL BOWL**	1		1
585	OW-447	**CLAMP WIRE** and **THUMB NUT ASSEMBLY**	1		1
586	06096	**BOWL GASKET** (Wisconsin No. QD-653)	1		5

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	YC-66-D-S1	**HIGH TEMPERATURE SAFETY SWITCH KIT** – Complete..... Consisting of:			8
562	PH-22	**WASHER,** 3/8" I.D., plain steel ..... For switch to cylinder head mounting.	1		1
563	PH-377-B	**GROMMET** for ignition wire	1		1
564	SD-233	**INSTRUCTION DECAL**.....	1		1
56	XD-31	**CAPSCREW,** 3/8"-16 thread x 1¾" long, hexagon head ..... For switch to cylinder head mounting.	1		1
566	YC-66-D	**HIGH TEMPERATURE SAFETY SWITCH** ..... For replacement, order YC-66-D-S1 Kit.	1		3
567	YL-357-42	**WIRE ASSEMBLY,** 42" long, with terminals. (Wire coiled to suit all models.)	1		1

Order parts from nearest ***SERVICE STATION*** shown in directory following parts list.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

PRESTOLITE MBP-4012T (24 Volt) STARTING MOTOR PARTS LIST
WISCONSIN MOTOR PART NUMBER YA-20A-1



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Ref. No.	Prestolite Part Number	Description	No Req
1	MBP-2001BS	**FRAME** and **FIELD ASSEMBLY** ..... Consisting of:	1
2	Not	**INSULATING BUSHING** for terminal stud ..	1
3	Serviced	**INSULATING WASHER** for terminal stud ...	1
4	See Note	**PLAIN WASHER** for terminal stud	1
5		**LOCKWASHER** for terminal stud	1
6		**NUT** for terminal stud	1
7	12X-1014	**LOCKWASHER**, 5/16", for terminal stud ..	1
8	X-180	**NUT** for terminal stud, 5/16"-24 thread, hex.	1
9	Not	**TERMINAL STUD**	1
10	Serviced	**FIELD COIL ASSEMBLY**	1
11	See Note	**INSULATION** for field coils	1
12		**SCREW** for pole shoe	4
13		**CONNECTOR** for field coil.....	2
14		**INSULATION**	1
15	MBW-2012CS	**BRUSH SET** (includes Ref. No. 18)	1
16	MBP-2002A	**COMMUTATOR END HEAD ASSEMBLY** ..... Includes:	1
17	MAD-110	**FELT**	1
18	MBP-1034AS	**GROUNDED BRUSH** (Part of Ref. No. 15) ..	2
19	MZ-19C	**BRUSH SPRING**	4
20	12X-196	**LOCKWASHER** for head screw, No. 10	4
21	20X-902	**SCREW** for head mounting ..... No. 10-32 thread x 3/8" long, fillister head.	4
22	MBP-3366FT	**ARMATURE ASSEMBLY**	1
23	MBP-54	**THRUST WASHER** for armature	2
24	MU-54	**THRUST WASHER** for armature (1/32" thick)	1

Ref. No.	Prestolite Part Number	Description	No Req
25	X-261	**KEY** for mounting Bendix, No. 6 Woodruff ..	1
26	EBB-44B	**BENDIX DRIVE ASSEMBLY** ..... Eclipse No. 480029. (EBB-44-A, Eclipse No. A-3517, replaced by EBB-44B) Consisting of the following Eclipse Part No's:	1
		F-4610 LOCKWASHER.....	2
		F-4616 DRIVE HEAD.....	1
		F-4619 HEAD SCREW	1
		F-4618 SHAFT SCREW.....	1
		F-4855 DRIVE SPRING	1
		F-6533 SCREW SHAFT ASSEMBLY ..... (F-6745 replaced by F-6533)	1
		F-4721 SLEEVE (Not illustrated)	1
27	MZ-52B	**SCREW** for pinion housing mounting ..... No. 10-32 thread x 31/32" long.	4
28	12X-196	**LOCKWASHER** for housing screw, No. 10 ...	4
29	MZ-1360A	**BEARING ASSEMBLY,** intermediate	1
30	MZ-359A	**GASKET** for intermediate bearing ..... (Not illustrated)	1
31	20X-63	**SCREW** for intermediate bearing ..... No. 8-32 thread x 3/8" long, flat head.	4
32	PS-1330A	**PINION HOUSING ASSEMBLY** ..... Includes:	1
33	MZ-358A	BEARING CAP (not illustrated)	1
34	MZ-364	BRONZE BEARING.....	1
35	XA-832	OIL SEAL (not illustrated).....	1
36	MZ-1024AD	**COVER BAND**	1
37	X-2882	**SCREW** for cover band ..... No. 10-32 thread x 1½" long, fillister head.	1
38	X-2875	**NUT** for cover band ..... No. 10-32 thread, square.	1

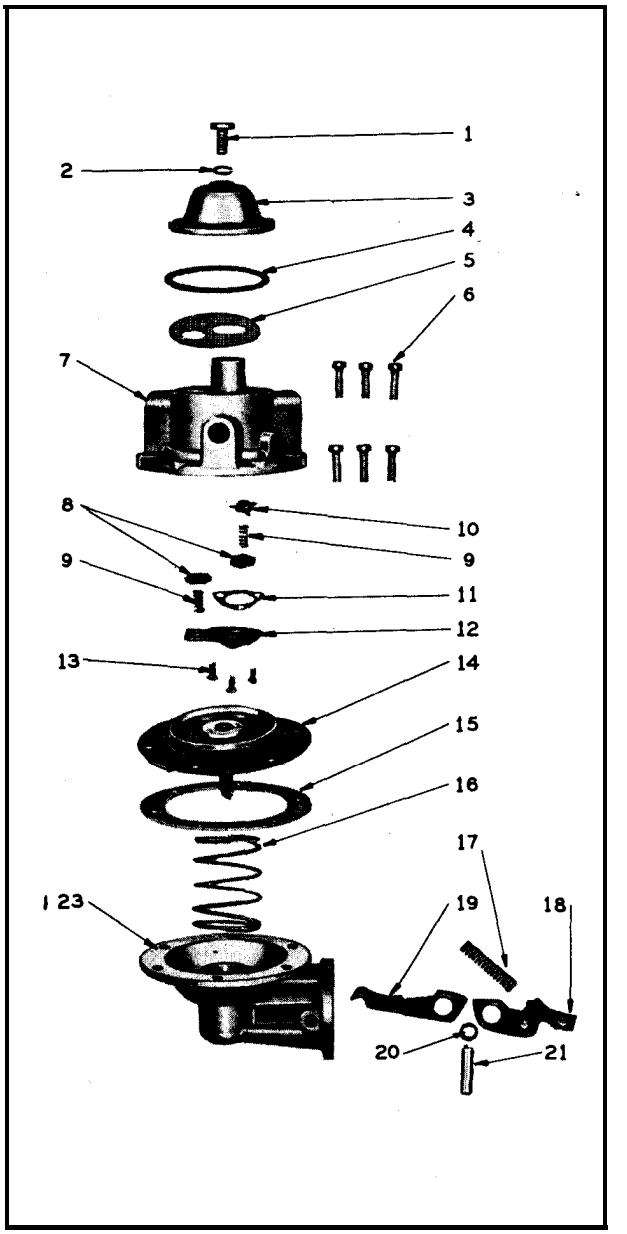
NOTE: Due to the method of installing field coils and other components in the frame and field of fungus resistant assemblies, it is necessary to replace the frame and field assembly if field coils are required.

FUEL PUMP MAINTENANCE AND REPAIR INSTRUCTIONS

WISCONSIN MOTOR PART No. LP-38 (Standard), LP-38-C (Cold Weather: -65°F)
USED ON 4 CYLINDER AIR COOLED ENGINES

The fuel pump, like all other parts of the engine, is subject to wear and you will find that any time after 500 hours of use, its efficiency will gradually decrease. This is indicated by the engines faltering at high speeds or when heavy loads are suddenly applied. The pump can easily be restored to its normal efficiency by the installation of a **Wisconsin Motor No. LQ-30 or LQ-30-A** repair kit.

1. Remove the fuel lines and the two mounting bolts which hold the pump to the engine. Take the pump to a work bench or suitable place.
2. With file make an indicating mark across a point at the union of castings (7 and 23). This is a positive location of the fuel line positions when reassembling. Remove six assembly screws (6) and remove fuel head. Dome bolt (1) is taken out, and the dome (3), dome gasket (4) and filter screen (5) disassembled.
3. Turn bead (7) over and remove three screws (13). Remove (8, 9, 10, 11 and 12) valve assemblies noting their positions. Discard Details 8, 9 and 11.
4. Clean head thoroughly with gasoline and a fine brush.
5. Holding fuel head (7) with diaphragm surface (containing 6 clearance holes) up, reassemble the valve spring retainer (10) into position, deepest hole. Place new valve plate gasket (11) in position around this hole. Stand on end one of the new valve springs (9) in the retainer. Place a new valve (8) on top of this spring.
6. Place the other new valve (8) on top of brass valve seat next to the previously assembled parts, stand the other new valve spring (9) on top of this valve.
7. Carefully place valve plate (12) over these assemblies so the large raised ring is nearest the valve gasket (11). Insert and carefully tighten the three assembly screws (13).
8. Carefully clean and replace the filter screen (5).
9. Place new dome gasket (4) into the dome (3) and put this unit into position on the fuel head (7).
10. Put new dome bolt gasket (2) on the dome bolt (l), insert in the hole in the dome (3) and tighten properly.
11. Place this fuel head assembly in a. clean place and we are ready to rebuild the lower diaphragm section.
12. Using a screw driver inserted into the coils of rocker arm spring (17) remove this spring and discard.
13. Hold the mounting bracket (23) in the left hand with the rocker arm toward your body and the thumb nail on the end of the link (19) with the heel of right hand on the diaphragm (14) compress the diaphragm spring (16) at the same time pulling toward your body, this will unhook the diaphragm from the link (19) so it can be removed.
14. Clean the mounting bracket (23) with gasoline.
15. Place the remaining new cork gasket (15) on the corresponding surface of the mounting bracket (23). Assemble the new diaprhragm operating spring (16) standing it into (23). Now repeat in reverse Step 13 using the new diaphragm, rocker arm, pin, linkage and bushing. Assemble new rocker arm spring.
16. Mount this assembly back on the engine in the position from which it was removed, using the new mounting gasket which is the last piece of the repair kit.
17. Crank the engine over to a position where the diaphragm (14) is laying flat on the mounting bracket (23). Place the fuel head (7) back in position so the indicating marks of Step 1 are in line, and start the six assembly screws approximately three turns. Again crank the engine over to a position where the diaphragm (14) is pulled down into (23) mounting bracket and tighten the six assembly screws (6) tightly.
18. Connect the fuel lines and you have a completely rebuilt fuel pump.



INSTRUCTIONS FOR FUEL PUMP MAINTENANCE AND REPAIR

The gaskets (2 and 4) used in the fuel head (7) of the fuel pump have a natural tendency to shrink when left standing in a dry condition. This shrinking can create vacuum leaks which result in the hard starting of the engine. It is necessary after an engine has stood on the stockroom or show room floor any length of time that the dome bolt No. 1, the assembly screws (6) of which there are six and the fuel line connections be tightened carefully to assure quick starting and satisfactory operation thereafter.

CLEANING OF FUEL PUMP

The industrial engine is used under so many adverse conditions that many times a pump will fail because of the dirt in the fuel head. This can recleaned by this procedure.

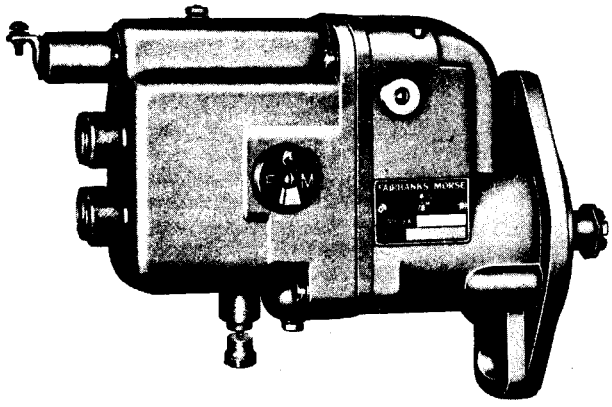
1. **With file make an indicating mark across a point of the union of castings (7 and 23). This is a positive location of the fuel line positions when reassembling.**
2. **Remove the two fuel lines.**
3. **Remove six assembly screws (6) and remove fuel head.**
4. **Bolt (l) is taken out, and the dome (3), dome gasket (4) and filter screen (5) disassembled.**
5. **The preceding steps reveal the sediment cavities of the head which are filled with dirt. Wash this out with gasoline and a fine brush, being careful not to damage the valve assemblies, in the lower cavity of the fuel head (7).**
6. **The pump is now ready to reassemble. Crank the engine over to a position where the diaphragm (14) is laying flat across the casting face (23). Place the fuel head (7) back in position so the indicating marks of Step No. 1 are in line and start the six assembly screws approximately three turns. Again crank the engine over to a position where the diaphragm (14) is pulled down into (23) the mounting bracket. Now tighten the six screws (6) securely.**
7. **Carefully clean and replace the fitter screen (5).**
8. **Replace the dome gasket (4) into the dome (3) and put this unit into position on the fuel head (7).**
9. **Replace the gasket (2) on the dome bolt (1) and insert in the hole in the dome (3) then tighten securely.**
10. **Replace fuel lines and tighten securely. Your pump is now in condition to give many long hours of additional service.**

NOTE: The LQ-30 or LQ-30-A Repair Kit and the parts included there-in, which are identified by an asterisk (*), are the only parts of the fuel pump available for service.

Ref. No.	Description	No. Req.
1	PULSATOR DOME BOLT	1
* 2	DOME BOLT GASKET	1
3	PULSATOR DOME	1
* 4	DOME GASKET	1
5	FILTER SCREEN	1
6	SCREWS for mounting fuel head	6
7	FUEL HEAD	1
* 8	VALVE	2
* 9	VALVE SPRING (7 coils)	2
10	VALVE SPRING RETAINER	1
*11	VALVE PLATE GASKET	1
12	VALVE PLATE	1
13	SCREWS for valve plate	3
*14	DIAPHRAGM—for Standard LP-38 Fuel Pump (LQ-30 Repair Kit)	1
	OR	
	DIAPHRAGM—for Cold Weather, LP-38-C Fuel Pump (LQ-30-A Repair Kit)	1
* 15	DIAPHRAGM GASKET	1
*16	DIAPHRAGM SPRING	1
*17	ROCKER ARM SPRING	1
18	ROCKER ARM	1
*19	LINKAGE	1
*20	ROCKER ARM BUSHING	1
* 21	ROCKER ARM PIN	1
* 22	MOUNTING GASKET (not illustrated)	1
23	MOUNTING BRACKET	1

Order parts from nearest SERVICE STATION shown in directory following parts list.
IMPORTANT:Always give Model, Specification and Serial Numbers as shown on name plate.

FAIRBANKS-MORSE TYPE FM-XZE4B7-4 MAGNETO - WIS. MOTOR No. Y-98-C-S1 FOR MODEL MVG4D ENGINE PER MIL-E-11275-C SPECIFICATIONS



235655 C-1

FIELD SERVICE AND ADJUSTMENT INFORMATION

GENERAL DESCRIPTION

This magneto is a special unit designed and built for use on engines manufactured by the Wisconsin Motor Corporation The magneto has the standard SAE flange mounting, but has a special coupling and drive gear arrangement.

The magneto has a feed thru condenser, which eliminates the necessity of a shielded ground wire and a witch, when remote stopping is required. The positive action ground switch on the magneto is of the push button type, and is held in either an open or closed position by a coiled spring.

SERVICE PROCEDURE

Improper functioning of the magneto is often believed to be the cause of engine trouble arising from other sources. A brief engine inspection will often locate the trouble before the magneto is reached and prevent maladjustment of magneto parts in good condition It is suggested that the magneto be opened only when it is certain that the magneto spark produced is unsatisfactory. This condition may be determined by a simple magneto spark test easily made in the field.

TESTING THE MAGNETO SPARK

Be sure the positive action ground switch is pulled out to open position before this test is made.

Remove the ignition cable from the No. 1 cylinder end cap tower and in its place insert a short piece of stiff wire. Bend this wire so it is not less than ¼" from the magneto housing or the engine block. Turn the engine over slowly and watch carefully for the spark which should occur at the instant the impulse coupling releases. Repeat this procedure with the remaining towers. If a strong spark is observed from all the towers, it is recommended that the magneto be eliminated as the source of the difficulty and that the cables, terminals, and spark plugs be thoroughly inspected. If a weak or no ignition spark is noted, check breaker point gap.

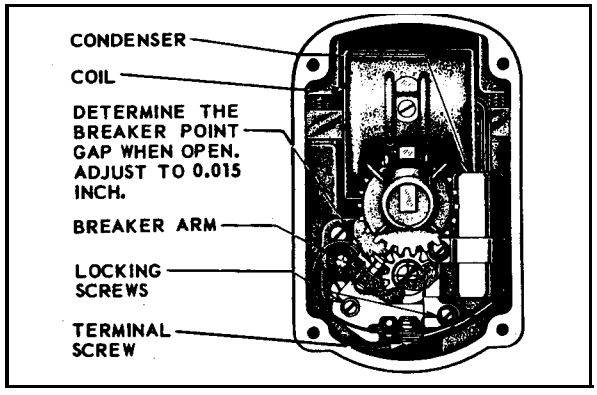


Fig. 1. END VIEW OF TYPE FM-XZE4B7 MAGNETO

SERVICE OF BREAKER POINTS

The breaker points should be inspected for evidence of pitting or pyramiding. A small tungsten file or fine stone may be used to resurface the points. Badly worn or pitted points should be replaced. If it is necessary to resurface or replace the breaker points, it will also be, necessary to readjust them to their proper clearance, which is 0.015 in. at full separation. This adjustment is made in the following manner: Be sure that the rubbing block is on the high point of the cam, to secure maximum separation of point a. Loosen the locking screws identified in Fig. 1. Then, move the contact plate until the proper breaker point clearance is obtained. This is accomplished by means of a screw driver inserted in the adjusting slot at the bottom of the contact plate and pivoted between the two small bosses on the bearing support. Locks the assembly in place by tightening the locking screws and take a find measurement of the breaker point gap after the locking screws are tightened.

FURTHER FIELD SERVICE NOT RECOMMENDED

The felt wick, if very dirty or completely saturated with grease, should be replaced by a clean, dry wick. The cam, if dry, should he given a light coating of FMCO 10 Magneto Grease. Other than this, the magnetos do not require field lubrication and any attempt to oil or grease the bearing is inadvisable. The lubricant should be renewed only during a complete overhaul of the magneto by a Factory-Authorized Magneto Service Station.

SEALING MAGNETO

Before replacing the end cap in the magneto frame, clean the contact surface a between the cap and the frame. Place a new gasket in the joint, and mount the end cap on the frame, tightening the four screws securely.

SPECIAL DRIVE GEAR

The magneto is equipped with a special drive gear mounted directly on the impulse coupling. If it is necessary at any time to remove the drive gear, special care must be exercised in reassembly. Remove the engine end cap and turn the rotor until the contact segment is in firing position for No. 1 cylinder as shown in Fig. 2. With the distributor rotor in this position fit the gear to the impulse coupling lugs so that the prick punch mark on the rim of the gear is in the position shown in Fig. 2.

TIMING MAGNETO TO ENGINE

Refer to Magneto Timing instructions, in the front section of this manual, for proper timing of magneto to the engine.

GROUND SWITCH - Positive Action

The new ground switch assembly used on this magneto is of the push button type that stops the engine by grounding the primary circuit. The button is held in contact with the termial screw by a spring mechanism, until the engine stops. The ground switch button is then pulled out to open the primary circuit, and remains in this position during the operating cycle, or until it is pushed in again. The switch must be hand actuated for starting or stopping the engine as it will remain in either position.

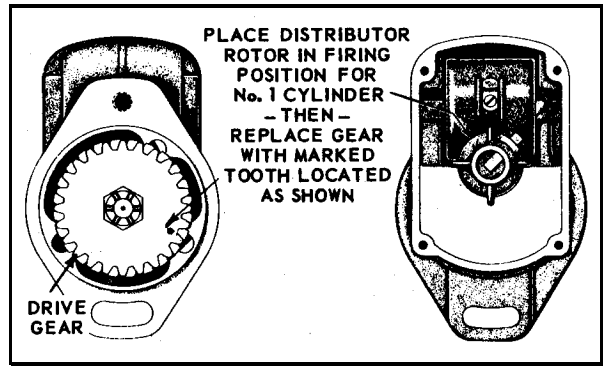
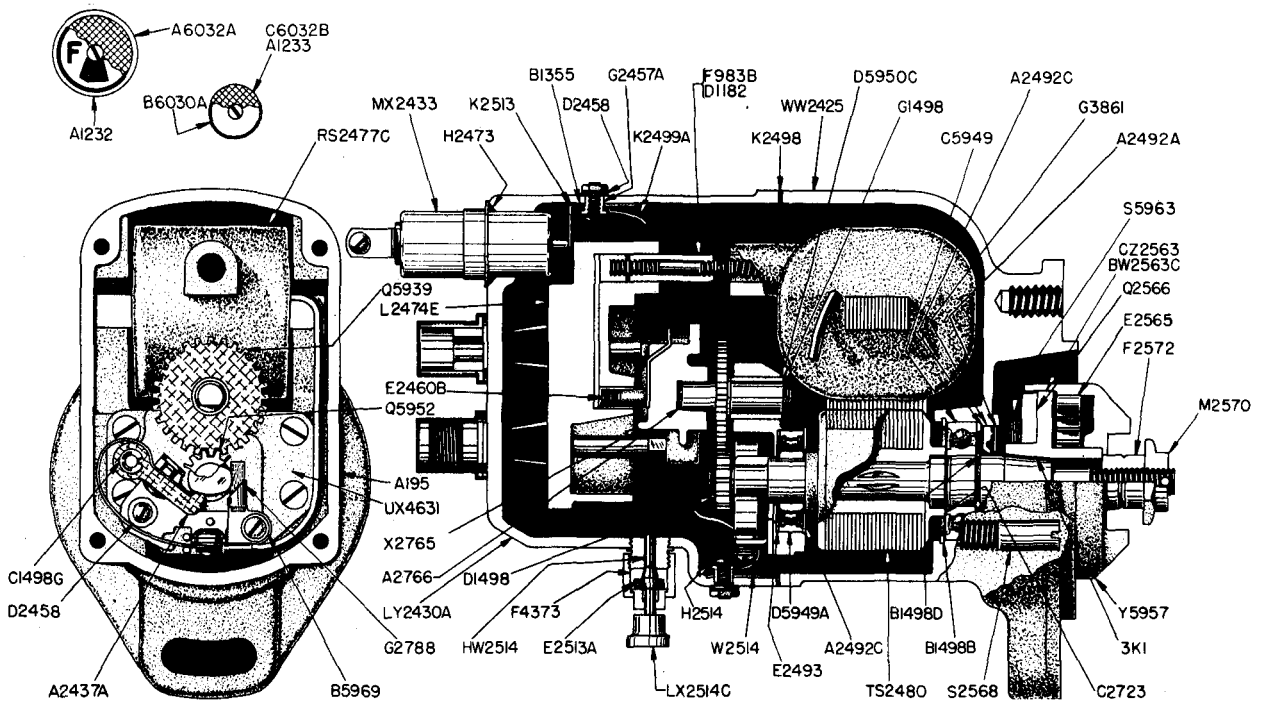


Fig. 2. DRIVE GEAR MARKING AND ASSEMBLY

MAGNETO - FAIRBANKS-MORSE No. FM-XZE4B7, WISCONSIN MOTOR No. Y-98-C-S1 PER MIL-E-11275-C SPECIFICATIONS

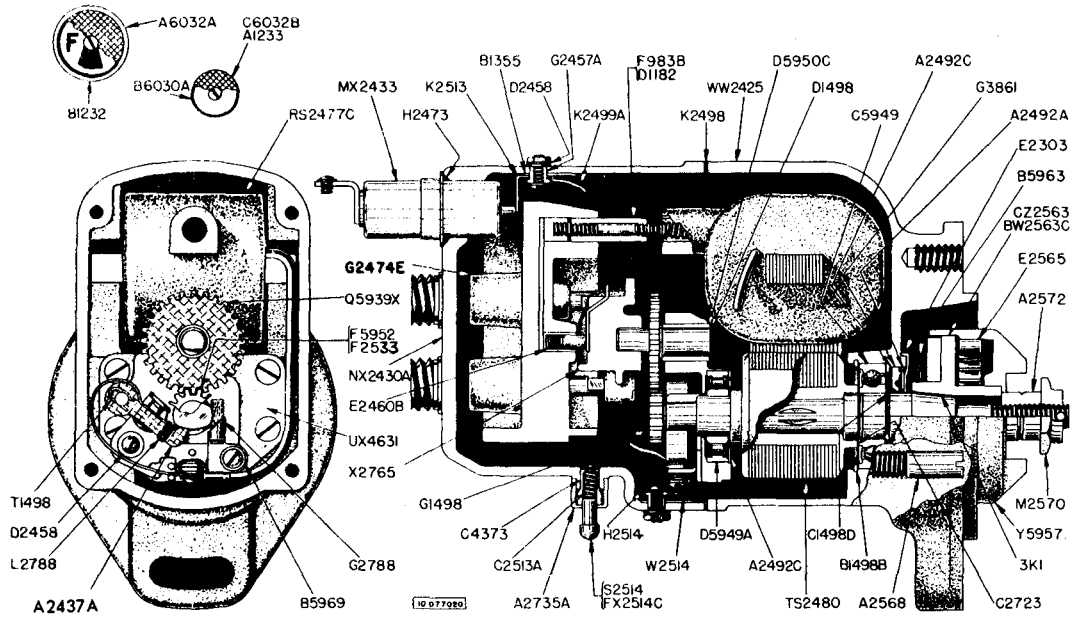


F-M Part No.		Description	No Req
F983B		High Tension Lead	1
D1182		Suppressor Insulator	1
A1232		Vent Cover	2
6S6N		Vent Cover Screw No. 6-32x3/8	2
A1233		Vent Cover Copper Wool	4
B1355		Ground Strip Guide	1
D1498		Rotor Gear Snap Ring	1
G1498		Distributor Shaft Snap Ring	1
C1498G		Fulcrum Pin Snap Ring	1
B1498B		Rotor Drive End Bearing Snap Ring	1
B1498D		Rotor Drive End Shaft Snap Ring	1
WW2425		Housing	1
LY2430A		End Cap Assembly	1
10S10D		End Cap Screw — No. 10-24X5/8	2
10S18D		End Cap Screw — No. 10-24x1-1/8	2
MX2433	*	Feed-thru Condenser	1
6S6D		Condenser Mtg. Screw No. 6-32x3/8	2
A2437A	*	Breaker Arm Support Bracket and Points	1
6S6Z		Breaker Terminal Screw & Lockwasher No. 6-32x3/8	1
6S6U		Contact Support Locking Screw and Lockwasher No. 6-32x3/8	1
8S6U		Contact Support Locking Screw and Lockwasher No. 8-32x3/8	1
G2457A		Ground Switch Insulating Bushing	1
D2458		Contact Support Locking Screw Flat Washer	1
D2458		Ground Switch Screw Plate Washer	1
E2460B		Brush and Spring Assembly	1
H2473	*	Condenser 'O' Ring Seal	1
L2474E	*	Distributor Block	1
8S8D		Distributor Block Screws — No. 8-32x1/2	4
RS2477C		Coil	1
31SS14A		Coil Bridge Setscrew — 5/16-24x7/8"	2
TS2480		Magnetic Rotor	1
A2492A		Rotor Drive End Seal Outer Washer	1
A2492C		Rotor Drive End Seal Inner Washer	1
A2492C		Rotor Bearing Grease Retaining Washer	1
E2493		Grease Retaining Washer	1
K2498		End Cap to Frame Gasket	1
K2499A		Ground Switch Wire Assembly	1
K2513		Condenser Contact	1
E2513A		Ground Switch Button Spring	1
H2514		Primary Ground Terminal Strip	1
6S8N		Ground Switch Terminal Screw No. 6-32x1/2	2
6LW1		Ground Switch Terminal Screw Lockwasher	2

F-M Part No.		Description	No Req
6N1		Ground Switch Terminal Screw-Nut	2
W2514		Ground Switch to Contact Support	1
HW2514		Ground Switch Plunger, Nut and Button Assem.	1
LX2514C		Ground Switch Assembly Complete	1
CZ2563		Coupling Hub Assembly	1
BW2563C		Impulse Coupling Complete	1
E2565		Impulse Coupling Drive Spring	1
Q2566		Coupling Pawl	2
29-45		Pawl Snap Ring	2
S2568		Impulse Coupling Pawl Stop Pin	1
M2570		Impulse Coupling Nut	1
F2572		Impulse Coupling Bushing	1
C2723		Rotor Drive End Bearing Shim	2
X2765	*	Distributor Rotor	1
A2766		Distributor Rotor Spring Clip	1
G2788		Cam Wick and Holder	1
G3861		Rotor Drive End Seal	1
F4373		Ground Switch Spacer	1
UX4631		Bearing Support	1
8S6G		Bearing Support Screw — No. 8-32x3/8	4
Q5939		Distributor Gear Assembly	1
C5949		Rotor Drive End Bearing	1
D5949A		Rotor Cam End Bearing	1
D5950C		Distributor Bearing	1
Q5852		Rotor Gear	1
Y5957		Impulse Coupling Shell	1
S5963		Impulse Coupling Pawl Spring	2
B5969		Contact Support Locking Screw Plate Washer	1
B6030A		Vent Cover	2
6S4L		Vent Cover Screw — No. 6-32x1/4	2
A6032A		Vent Cover Screen	2
C6032B		Vent Cover Screen	2
3K1		Key (Rotor to Impulse Coupling)	1
SK90		Service Kit	1

* Parts Included in Service Kit.

MAGNETO - FAIRBANKS-MORSE No. FM-XZE41B7, WISCONSIN MOTOR No. Y-98-A-S1 PER MIL-E-11275-B SPECIFICATIONS

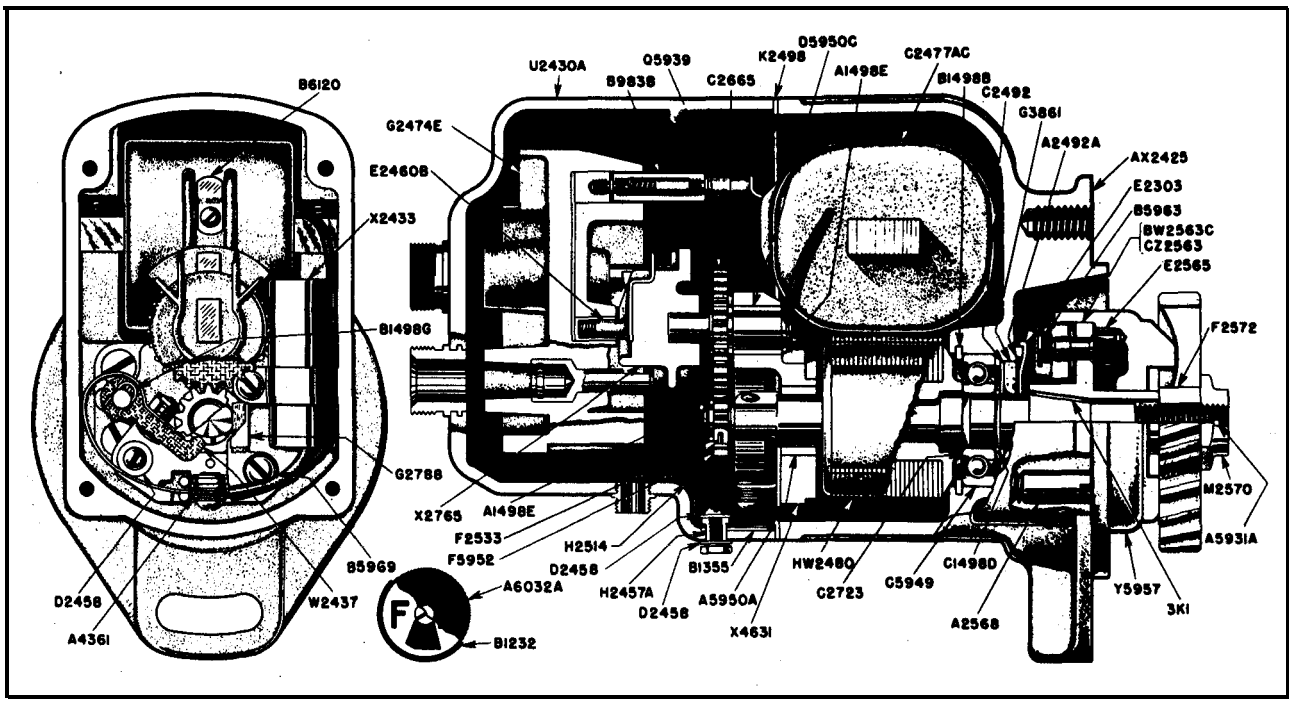


F-M Part No.	Description	No Req
F983B	High Tension Lead	1
D1182	Suppressor Insulator	1
B1232	Vent Cover	2
6S6N	Vent Cover Screw No. 6-32x3/8	2
A1233	Vent Cover Copper Wool	4
B1355	Ground Strip Guide	1
D1498	Rotor Gear Snap Ring	1
G1498	Distributor Shaft Snap Ring	1
T1498	Fulcrum Pin Snap Ring	1
V1498	Ground Switch Button Snap Ring	1
B1498B	Rotor Drive End Bearing Snap Ring	1
C1498D	Rotor Drive End Shaft Snap Ring	1
E2303	Oil Slinger Baffle Disc	1
WW2425	Frame	1
NX2430A	End Cap	1
10S10D	End Cap Screw – No. 10-24x5/8	2
10S18D	End Cap Screw – No. 10-24x1-1/8	2
MX2433 *	Feed-thru Condenser	1
6S6D	Condenser Mtg. Screw No. 6-32x3/8	2
A2437A *	Breaker Arm Support Bracket and Points	1
6S5U	Breaker Terminal Screw & Lockwasher No. 6-32x3/8	1
6S6U	Contact Support Locking Screw and Lockwasher No. 6-32x3/8	1
8S5U	Contact Support Locking Screw and Lockwasher No. 8-32x3/8	1
G2457A	Ground Switch Insulating Bushing	1
D2458	Contact Support Locking Screw Flat Washer	1
D2458	Ground Switch Screw Plate Washer	1
B2460B	Brush and Spring Assembly	1
H2473 *	Condenser 'O' Ring Seal	1
G2474E *	Distributor Block	1
8S8D	Distributor Block Screws – No. 8-32x1/2	4
RS2477C	Coil	1
4SS14A	Coil Bridge Setscrew 1/4-20x7/8	2
TS2480	Magnetic Rotor	1
A2492A	Rotor Drive End Seal Outer Washer	1
A2492C	Rotor Drive End Seal Inner Washer	1
A2492C	Rotor Bearing Grease Retaining Washer	1
K2498	End Cap to Frame Gasket	1
K2499A	Ground Switch Wire Assembly	1
K2513	Condenser Contact	1
C2513A	Ground Switch Button Spring	1

F-M Part No.	Description	No Req
H2514	Primary Ground Terminal Strip	1
6S8N	Ground Switch Terminal Screw No. 6-32x1/2	2
6LW1	Ground Switch Terminal Screw Lockwasher	2
6N1	Ground Switch Terminal Screw-Nut	2
S2514	Ground Switch Push Button	1
W2514	Ground Switch to Contact Support	1
FX2514C	Push Button Ground Switch Assembly	1
F2533	Rotor Gear Pin	1
CZ2563	Coupling Hub Assembly	1
BW2563C	Impulse Coupling Complete	1
E2565	Impulse Coupling Drive Spring	1
A2568	Impulse Coupling Pawl Stop Pin	1
M2570	Impulse Coupling Nut	1
A2572	Impulse Coupling Bushing	1
C2723	Rotor Drive End Bearing Shim	1
A2735A	Ground Switch Nut	1
X2765 *	Distributor Rotor	1
G2788	Cam Wick and Holder	1
L2788	Breaker Arm Wick	1
G3861	Rotor Drive End Seal	1
C4373	Ground Switch Bushing	1
UX4631	Bearing Support	1
8S6G	Bearing Support Screw – No. 8-32x3/8	4
Q5939	Distributor Gear	1
C5949	Rotor Drive End Bearing	1
D5949A	Rotor Cam End Bearing	1
D5950C	Distributor Bearing	1
F5952	Rotor Gear	1
Y5957	Impulse Coupling Shell	1
B5963	Impulse Coupling Pawl Spring	1
B5969	Contact Support Locking Screw Plate Washer	1
B6030A	Vent Cover	2
6S5N	Vent Cover Screw – No. 6-32x5/16	2
A6032A	Vent Cover Screen	2
C6032B	Vent Cover Screen	2
3K1	Key (Rotor to Impulse Coupling)	1
GK22	Gasket Kit	1
SK45	Service Kit	1

* Parts Included in Service Kit.

PARTS LIST
FOR FAIRBANKS-MORSE TYPE FM-XE4B7 MAGNETO
PER MIL-E-11275-A SPECIFICATIONS
WISCONSIN MOTOR No. Y-98-S1



NOTE: Part numbers shown are Fairbanks-Morse Part Numbers.

Part Number	Description	No. Req.
B983B	High Tension Lead and Suppressor	1
B1232	Vent Hood	2
6S6N	Vent Hood Screw	2
B1355	Primary Ground Strip Guide	1
A1498E	Magnetic Rotor Gear Snap Ring	1
A1498E	Distributor Shaft Snap Ring	1
B1498B	Rotor Drive End Bearing Snap Ring	1
B1498G	Fulcrum Pin Snap Ring	1
C1498D	Rotor Drive End Shaft Snap Ring	1
E2303	Oil Slinger Baffle Disc	1
AX2425	Frame	1
U2430A	End Cap and Vent Assembly	1
10S10D	End Cap Screw (No. 10-24x5/8")	2
10S18D	End Cap Screw (No. 10-24x1-1/8")	2
X2433	Condenser Assembly	1
8S4U	Condenser Mounting Screw (No. 8-32x¼")	1
W2437	Breaker Arm Support Bracket & Points	1
6S5N	Breaker Arm Terminal Screw	1
6LW2	Breaker Arm Terminal Screw Lockwasher (No. 6)	1
6S6N	Contact Support Locking Screw (No. 6-32x3/8")	1
6LW2	Contact Support Locking Screw Lockwasher (No. 6)	1
8S6N	Contact Support Locking Screw (No. 8-32x3/8")	1
8LW3	Contact Support Locking Screw Lockwasher (No. 8)	1
H2457A	Primary Ground Terminal Bushing	1
D2458	Contact Support Locking Screw Washer	1
D2458	Primary Ground Washer	2
E2460B	Coil Lead Brush and Spring	1
G2474E	Distributor Block	1
8S8D	Distributor Block Screw (No. 8-32x½")	4
C2477AC	Coil (Inc. B6120, 6S3N)	1
25SS14A	Coil Bridge Setscrew (¼-20x7/8")	2
HW2480	Magnetic Rotor Assembly	1
A2492A	Rotor Drive End Seal Outer Washer	1
C2492	Rotor Drive End Seal Inner Washer	1

Part Number	Description	No. Req.
K2498	End Cap to Frame Gasket	1
H2514	Primary Ground Strip	1
6S8N	Primary Ground Screw (No. 6-32x½")	1
6N1	Primary Ground Nut (No. 6-32)	1
6LW1	Primary Ground Nut Lockwasher (No. 6)	1
F2533	Magnetic Rotor Gear Pin	1
BW2563C	Impulse Coupling (UB40, CW, 25°-30° lag) (BW2563C inc. CZ2563, E2565, Y5957)	1
CZ2563	Impulse Coupling Hub (CW, 25°-30° lag) (CZ2563 inc. B5963)	1
E2565	Impulse Coupling Drive Spring	1
A2568	Impulse Coupling Pawl Stop Pin	1
M2570	Impulse Coupling Nut	1
F2572	Drive Gear Bushing	1
C2665	Distributor Gear Thrust Washer	1
C2723	Rotor Drive End Bearing Shim (as needed)	2
X2765	Distributor Rotor	1
G2788	Cam and Wick Holder Assembly	1
G3861	Magnetic Rotor Drive End Seal	1
A4361	Primary Wire Terminal for No. 8 Screw	2
X4631	Bearing Support Assembly	1
8S8G	Bearing Support Screw (No. 8-32x3/8")	4
A5931A	Impulse Coupling Lockwire	1
Q5939	Distributor Shaft and Gear Assembly	1
C5949	Magnetic Rotor Drive End Bearing	1
A5950A	Magnetic Rotor Bearing (Opp. Drive End)	1
D5950C	Distributor Bearing	1
F5952	Magnetic Rotor Gear	1
Y5957	Impulse Coupling Shell	1
B5963	Impulse Coupling Hub Pawl Spring	2
B5969	Contact Support Locking Screw Washer	1
A6032A	Vent Screen	2
B6120	Coil Clip	1
6S3N	Coil Clip Screw (No. 6-32x3/16")	1
3K1	Key (Rotor to Impulse Coupling)	1

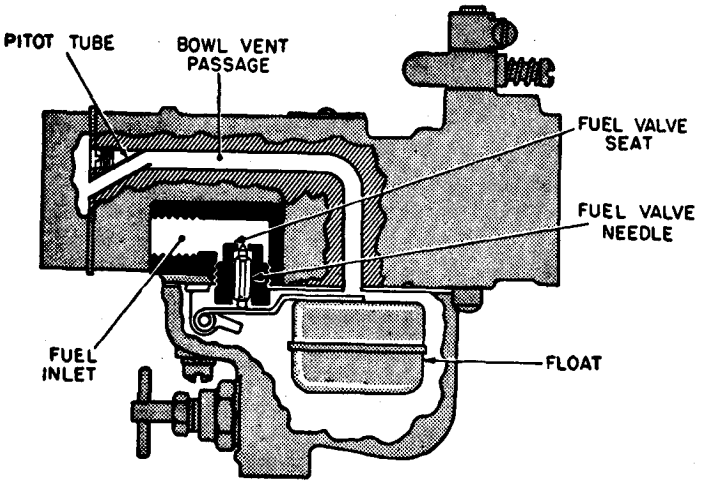
ZENITH 87A8 CARBURETOR

FOR WISCONSIN MOTOR CORPORATION

The Zenith 87-Series is a horizontal carburetor with a concentric fuel bowl. It is a "balanced" carburetor, because all air for fuel chamber and metering well ventilation and idling must come through the air cleaner. Air cleaner restrictions have a minimum influence on the fuel-air ratio when a carburetor is thus "balanced".

The main jet and discharge jet are centrally located. The metering well which completely surrounds the discharge jet is in the center of the fuel bowl assembly. This construction permits extremely high angle operation in any direction.

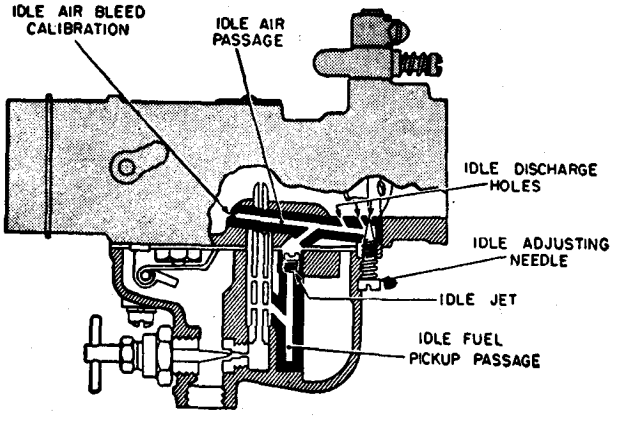
The venturi, which is part of the throttle body casting, measures the volume of air that passes through the carburetor. In selecting the venturi size, the smallest size that will permit full power development should be used.



FUEL SUPPLY SYSTEM

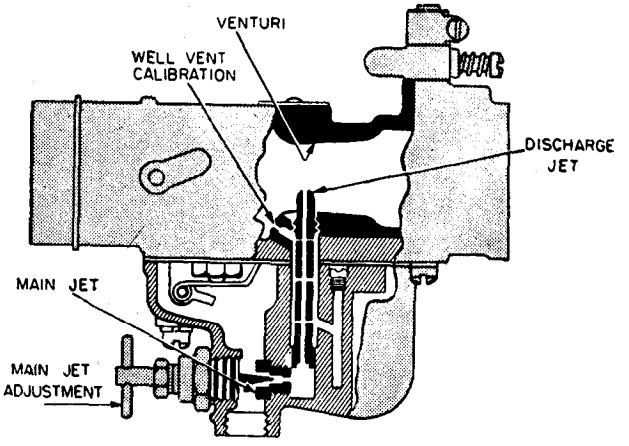
FUEL SUPPLY SYSTEM. Fuel under normal pressure entering the float chamber through the fuel valve seat is controlled by the twin float which, moving on its axle, closes the needle valve when the fuel reaches the proper level in the bowl.

IDLING SYSTEM. At idling speeds the throttle plate is almost closed, thus a very high suction exists at the edge of the throttle plate. At this point the idle discharge orifices are located. All fuel for idling and part throttle operation is supplied through the main jet. Fuel from the float chamber flows through the main jet into the metering well. Fuel for idling is drawn from this well through the calibration, or metering orifice, in the center of the idling jet. As the fuel reaches the idling channel it is mixed with air. which is admitted through a calibrated orifice in the channel from the inside of the air intake to form an emulsion. This emulsion is discharged into the air stream, to form the idling mixture, through two holes, one of which is controlled by the idle adjusting needle. Turning the adjusting needle counter-clockwise (out) permits more of the emulsion to reach the air stream and make the idling mixture richer while turning the needle in (clock. wise) cuts off the amount of the emulsion reaching the air stream and makes the mixture leaner.



IDLE SYSTEM

HIGH SPEED SYSTEM. As the throttle is opened, the suction on the idling system diminishes, but the increased volume of air entering the engine through the venturi creates sufficient vacuum (suction) on the discharge jet to draw an emulsion of fuel and air from the metering well which receives its fuel from the main jet and its air from the well vent. The flow characteristics of the discharge jet



HIGH SPEED SYSTEM

are influenced by the size, location, and number of holes in the sides of that part of the jet which is in the metering well, as well as by the sizes of the discharge jet orifice, the size of the main jet, and the size of the well vent. The well vent is located in the air intake and permits air to enter the top of the metering well around the outside of the discharge jet. The flow of fuel through the main jet is controlled by the main jet adjustment.

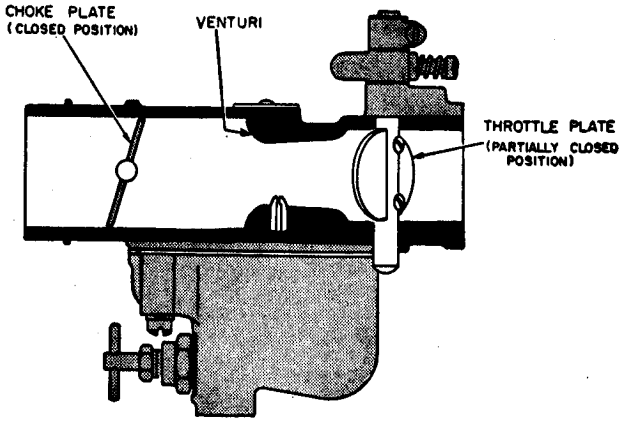
CHOKE SYSTEM. Starting a cold engine requires a much richer mixture of fuel and air. Moving the choke lever to close the choke plate restricts the air entering the carburetor, except at the pitot tube to the bowl vent, and increases the suction on the idling system which makes the mixture richer.

STARTING THE ENGINE. Before cranking the engine, the carburetor throttle should be opened a little to expose both idle discharge ports to suction. The choke should be fully closed until the engine starts, then opened a little to prevent stalling from being over-choked, then when the engine is fully warmed up the choke can be returned to wide open position and the throttle closed to the idling position.

ADJUSTMENTS. Adjust the throttle stop screw to obtain the desired idling speed by turning the screw in (clock-

wise) to increase the speed and out (counter-clockwise) to decrease the engine speed.

Adjust the idle adjusting needle to obtain smooth idling of the engine at idling speed. Turn the needle out (counter-



CHOKE SYSTEM

clockwise) to make the mixture richer, and in (clockwise) to make it leaner,

Adjust the main jet adjustment for full power of the engine while under a load. Turning the adjusting needle out (counter-clockwise) makes the mixture richer while turning the needle in (clockwise) cuts off the flow of fuel to make the mixture leaner.

NOTE: Do not try to operate on a very lean mixture; better performance and better fuel economy will be obtained if the mixture is not too lean.

DISASSEMBLY

A. IDENTIFY CARBURETOR

(a) Check numbers on metal identification disk riveted to top of throttle body. The inside number next to the rivet is the Zenith assembly number and the one next to the outer edge of the disk is the vehicle manufacturers.

B. DISASSEMBLED VIEWS

(a) The disassembled view will identify the various component parts and show the relation to assembly. Use the disassembled view to identify and locate parts when performing the disassembly and reassembly operations.

C. SEPARATE CARBURETOR BODIES

(a) Remove the three bowl assembly screws (45 & 46) and separate fuel bowl (39) from throttle body (26).

D. DISASSEMBLE FUEL BOWL

(a) Remove the main jet adjustment (43) and fibre washer (42), using a 9/16" open end wrench.
(b) Remove the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
(c) Remove the Idle Jet (38), using a small screwdriver.
(d) Remove the bowl drain plug (44).

E. DISASSEMBLE THROTTLE BODY

(a) Remove the float axle (35) by pressing against the end with the blade of a screwdriver.
(b) Remove the float (36).
(c) Remove the fuel valve needle (31), using the fingers.
(d) Remove the fuel bowl to throttle body gasket (37).
(e) Remove the main discharge jet (32), using a small
(f) Remove the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
(g) Remove the idle adjusting needle (17) and spring (18).

CLEAN AND INSPECT PARTS

A. CLEAN PARTS

(a) Clean all metal parts thoroughly with cleaning solution and rinse in solvent.
(b) Blow out all passages in the air intake assembly, fuel bowl assembly and throttle body. NOTE: Be sure all carbon deposits have been removed from throttle bore and idle discharge holes. It is advisable to reverse flow of compressed air in all passages to insure all dirt has been removed. Never use a wire or drill to clean out jets.

B. INSPECT PARTS

(a) Float Assembly. Replace float assembly if loaded with gasoline, damaged, or if float axle bearing is worn excessively. Inspect top side of float lever for wear where it contacts fuel valve needle.
(b) Float Axle. Replace if any wear can be visually detected on the bearing surface.
(c) Fuel Valve Seat & Needle Assembly. Replace fuel valve seat and needle because both parts wear and may cause improper float level.
(d) Idling Adjusting Needle and Spring. Inspect point of needle. This must be smooth and free of ridges.
(e) Gaskets and Fibre Washers. Replace all gaskets and fibre washers every time the carburetor is disassembled.
(f) Check Specifications. Verify the correctness of the following parts. Numbers will be found on the parts. Venturi; Main Jet; Idling Jet; and Fuel Valve

REASSEMBLY

A. REASSEMBLE THROTTLE BODY

(a) Install the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
(b) Install the main discharge jet (32), using a small screwdriver.
(c) Install fuel valve needle in seat (31), followed by float (36) and float axle (35). NOTE: Insert tapered end of float axle (35) into float bracket on side opposite slot and push through the other side. Press float axle (35) into slotted side until the axle is centered in bracket.
(d) Fuel Level. Check position of float assembly (36) for correct measurement to obtain proper fuel level using a depth gage. NOTE: Do not bend, twist, or apply

With bowl cover assembly (26) in an inverted position, viewed from free end of oat (36), the float body must be centered and at right angles to the machined surface. The float setting is measured from the machined surface (no gasket) of float bowl cover to top side of float body at highest point. This measurement should be 31/32" plus or minus 1/32".
(e) Bending Float Lever. To increase or decrease distance between float body (36) and machined surface (26) use long nosed pliers and bend lever close to float body. NOTE: Replace with new float if position is off more than 1/16".
(f) Install throttle body to fuel bowl assembly gasket (37) on machined surface of throttle body (26).
(g) Install the idle adjusting needle (17) and spring (18).

B. REASSEMBLE FUEL BOWL

(a) Install the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
(b) Install the main jet adjustment (43) and fibre washer (42), using a 9/16" open end wrench.
(c) Install the idle jet (38), using a small screwdriver.
(d) Install the bowl drain plug (44).

C. REASSEMBLE CARBURETOR BODIES

(a) Install the three bowl assembly screws (45 & 46) through the fuel bowl and into the throttle body and draw down firmly and evenly.

SPECIAL TOOLS

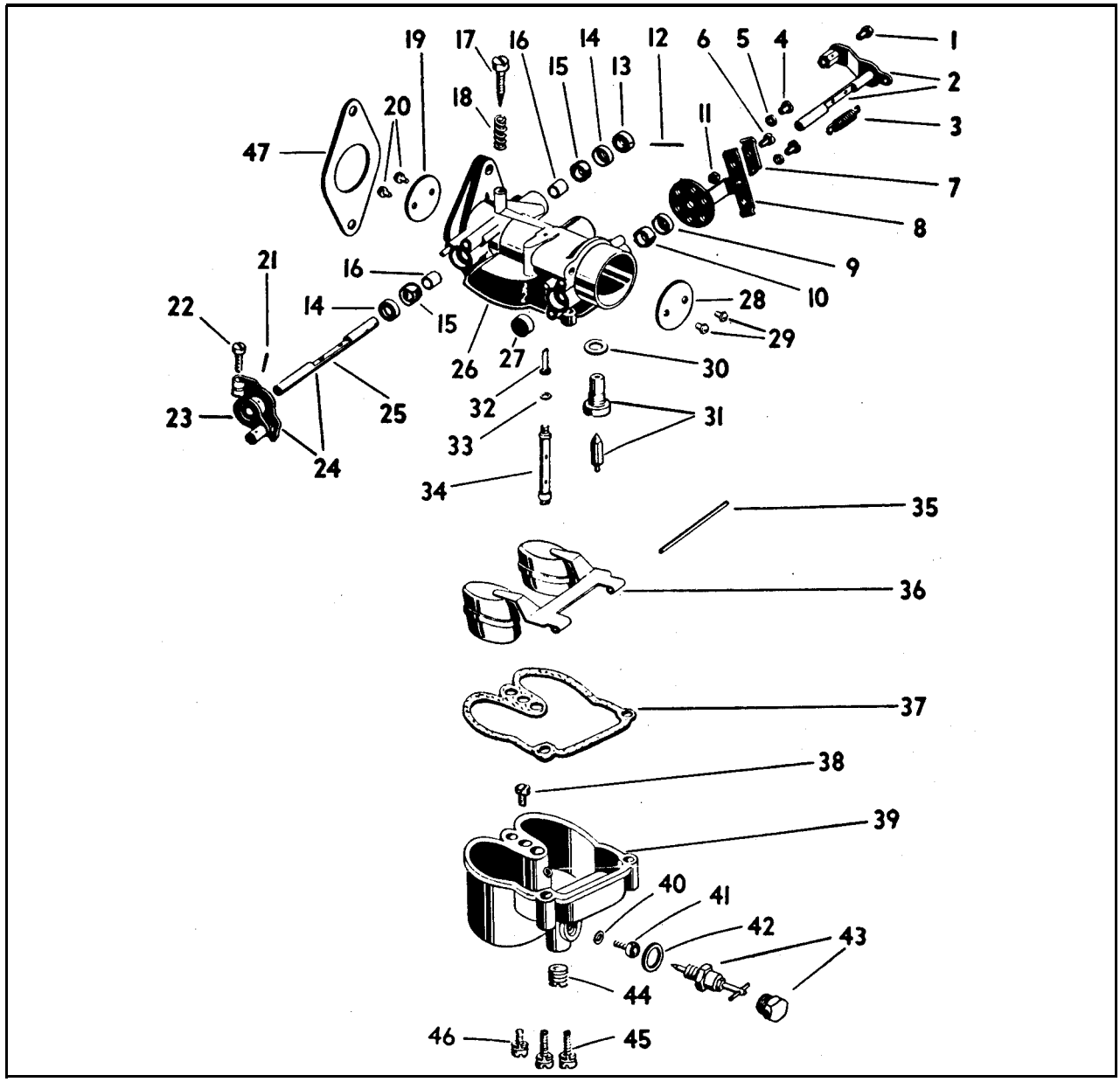
The special tools recommended for the 87-Series carburetors are:

1. C161-83 Main Jet Wrench.
2. C161-85 Fuel Valve Seat Wrench.

Parts List for Model 87A8 Zenith Carburetor

(FOR WISCONSIN MOTOR CORP.)

ZENITH No.	WISCONSIN No.
11532	L-57-1



Ref. No.	Part No.	Part Name
1	T8S8-6	Screw—Lever Swivel
2	C108-130	Shaft and Lever—Choke
3	C112-6	Spring—Choke Lever
4	C140-58	Screw—Bracket Assembly
5	T41-8	Lockwasher—Bracket Screw
6	T1S8-8	Screw—Tube Clamp
7	C110-7	Clamp—Bracket Tube
8	C109-60	Bracket—Choke
9	C131-4x2	Retainer—Choke Shaft Packing
10	CT57-4	Washer—Choke Shaft Packing

Ref. No.	Part No.	Part Name
11	T21S8	Nut—Clamp Screw
12	CT63-9	Taper Pin—Thrust Washer
13	C130-4	Washer—Shaft Thrust
14	CT52-53	Retainer—Throttle Shaft Packing
15	CT48-9	Washer—Throttle Shaft Packing
16	C9-72	Bushing—Throttle Shaft
17	C46-49	Needle—Idle Adjusting
18	C111-155	Spring—Adjusting Needle
19	C21-42	Plate—Throttle
20	T315B5-3	Screw—Throttle Plate
21	CT63-9	Taper Pin—Throttle Lever
22	T1S8-10	Screw—Lever Stop
23	CR27-241	Lever and Stop—Throttle
24	C29-1037	Shaft and Lever—Throttle (Items 21, 22, 23, 25)
25	C23-533	Shaft—Throttle
26		Body—Throttle. Not serviceable. Purchase complete carburetor.
27	CR37-1x1	Plug—Choke Shaft Hole
28	C102-113	Plate—Choke
29	†T315B5-3	Screw—Choke Plate
30	T56-20	Fiber Washer—Fuel Valve Seat
31	†C81-17-35	Valve and Seat—Fuel
32	C66-104-42	Jet—Discharge
33	†T56-73	Fiber Washer—Well
34	C76-50-1	Well—Metering
35	†C120-18	Axle—Float
36	C85-97	Float
37	†C142-55	Gasket—Bowl to Body
38	†C52-2-12	Jet—Idle
39	B3-98A	Bowl—Fuel
40	†T56-24	Fiber Washer—Main Jet
41	†C52-7-38	Jet—Main
42	†T56-23	Fiber Washer—Passage Plug
43	C138-23	Plug—Main Passage
44	CT91-5	Plug—⅛" Pipe (Bowl Drain)
45	†T301S8-14	Screw—Bowl to Body (Long)
46	T301S8-9	Screw—Bowl to Body (Short)
47	†C141-4-6	Gasket—Flange
	C181-296	Gasket Set
	K-11532	Repair Kit

† Parts Included in Repair Kit.

The Idle Air Bleed Bushing and Well Vent Bushing are calibrated parts of the Throttle Body (item 26) and are not readily removable.

Zenith service parts can be obtained promptly through our central and service distributors located in principal cities.

ZENITH CARBURETOR DIVISION

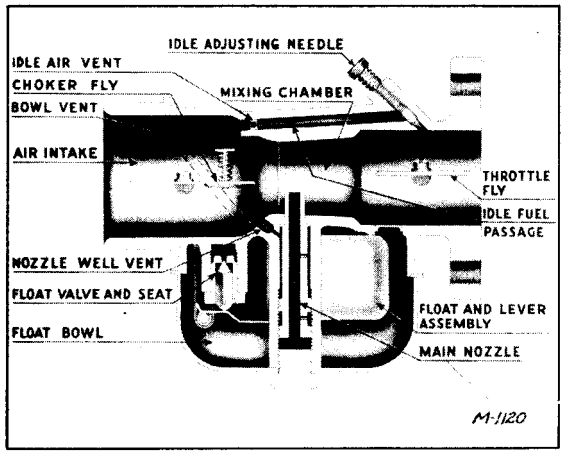
HART AVENUE **DETROIT 14, MICHIGAN**

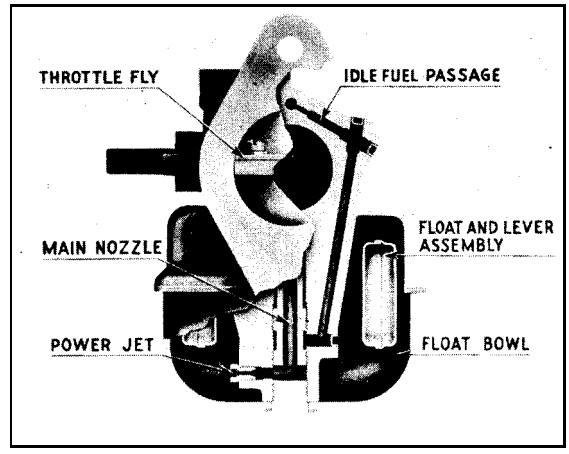
Bendix AVIATION CORPORATION

Manufacturers of Zenith Carburetors and Filters

MARVEL-SCHEBLER CARBURETOR

FOR WISCONSIN MODEL MVG4D ENGINE





DESCRIPTION

1. The Model VH-69-A (Wis. No. L-54-J-1) is a float type carburetor with idle fuel adjustment designed for use with the Model MVG4D Wisconsin Air Cooled gasoline engine, and is made up of two major units–a die cast aluminum throttle body and a stamped steel fuel bowl.
2. The model number is stamped on a square boss, provided for it on the body casting.

OPERATION

With the throttle fly slightly open from the closed position to permit idling, the main fuel nozzle may be delivering little or no fuel, as only a very small quantity of air passes through the mixing chamber at this time. An idle pasaage is provided to carry sufficient air and fuel to the engine side of the throttle fly where the suction is high, This passage takes the air from the inlet side of the venturi to the intersection of the vertical idle fuel passage (which connects with the main nozzle assembly) and delivers the air-fuel mixture through an opening controlled by the idle adjusting needle to the throttle barrel just beyond or on the engine side of the throttle fly. The idle system is practically independent of the main nozzle system, and only controls the fuel metering at low engine speed. As air-flow increases with the opening of the throttle fly the main nozzle begins to deliver fuel, and the delivery from the idle system decreases until at full throttle, delivery is entirely from the main nozzle.

ADJUSTING CARBURETOR

1. To start the engine, close the choker fly. When the engine starts, open choker to the proper warm-up position. After engine has warmed up, open choker fully.
2. Close the throttle and adjust the throttle atop screw to give the proper idle speed. The idle adjusting needle should be in proper adjustment at about 3/4 to 1 turn open, Turn the idle adjusting needle open until engine rolls from “richness", Then turn the needle towards the seat until the engine runs irregularly from “leanness”, From the “lean" setting, open the idle adjusting needle to the richest mixture that will not cause the engine to “roll” or run unevenly, This adjustment will, in most cases, give a slower idling speed than a slightly leaner adjustment with the same throttle stop screw setting, but will give the smoothest idle operation. After the idle adjusting needle setting has been made, it may be necessary to revise the throttle atop screw setting to give the proper idling speed.

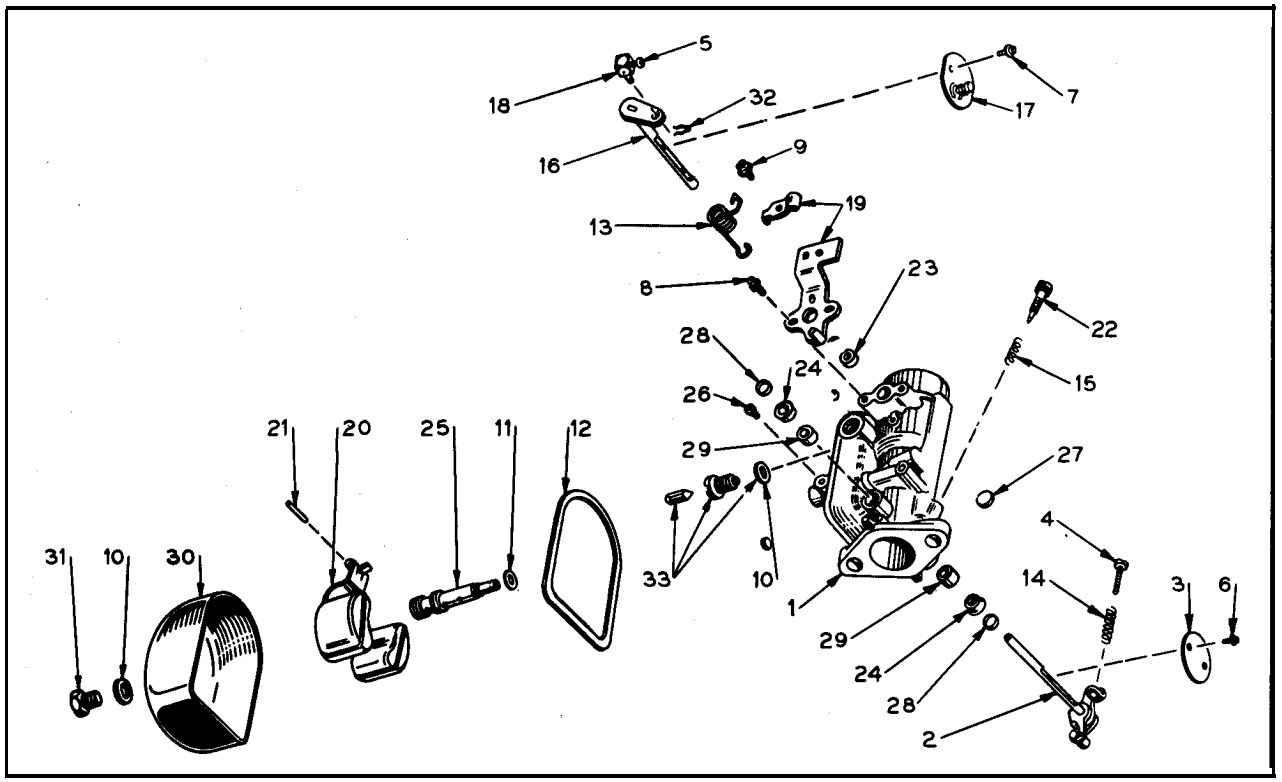
CAUTION:

Care should be taken not to damage the idle adjusting needle nor its seat by turning the idle adjusting needle too tightly against the seat, as damage to either of these parts will make a satisfactory idle adjustment very difficult.

MARVEL-SCHEBLER CARBURETOR DIVISION, BORG-WARNER CORPORATION

DECATUR, ILL., U.S.A.

PARTS LIST
FOR MARVEL-SCHEBLER CARBURETOR



NOT E: Port numbers shown are Marvel-Schabler Part Numbers.

Ref. No.	Part Number	Part Name - Description
1	10-3774	Carburetor Assembly — Complete
2	13-956	Throttle Shaft Assembly
3	14-214	Throttle Fly
4	15-42	Screw (No. 8-32 x ¼" Fillister Head) (Throttle Stop)
5	15-285	Screw (No. 8-32 x 5/16" Fill. Head) (Choke Swivel)
6	15-A46	Screw (No. 4-40 x ¼" Sems) (Throttle Fly)
7	15-A47	Screw (No. 4-40 x 3/16" Sems) (Choke Fly)
8	15-A93	Screw (No. 8-32 x 3/8" Fillister Head) (Sems) (Choke Bracket)
9	15-A99	Screw (No. 8-32 x 5/16" Sems) (Choke Bracket Clip)
10	16-4	Gasket (Bowl Plug — 1) (Float Valve Seat — 1)
11	16-456	Gasket (Nozzle)
12	16-A105	Gasket (Bowl)
13	24-213	Spring (Choke Return)
14	24-262	Spring (Throttle Adj.)
15	24-485	Spring (Idle Adjusting Needle)

Ref. No.	Part Number	Part Name - Description
16	26-720	Choke Shaft Assembly
17	27-559	Choke Fly Assembly
18	28-49	Choke Swivel
19	29-537	Choker Bracket Assembly
20	30-666	Float and Lever Assembly
21	32-27	Float Lever Shaft
22	43-129	Idle Adjusting Needle
23	44-38	Packing (Choke Shaft)
24	44-63	Packing (Throttle Shaft)
25	47-395	Main Nozzle
26	49-253	Power Jet
27	55-230	Cup (Choke Shaft)
28	55-231	Packing Retainer (Throttle Shaft)
29	60-439	Bushing (Throttle Shaft)
30	65-172	Fuel Bowl
31	80-166	Plug—Bowl Retaining
32	82-16	Cotter (Choke Swivel)
33	233-536	Matched Float Valve, Seat and Gasket Assembly
	286-776	Package Repair Kit
	16-649	Gasket Assortment

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
2610-00-050-9840	C-9	7			
6140-00-059-3528	C-1	2			
2610-00-089-5997	C-9	7			
6240-00-155-8714	C-2	52			
5310-00-159-6209	C-6	12			
4730-00-194-0210	C-3	42			
4730-00-194-0213	C-6	20			
4730-00-194-0225	C-3	32			
	C-3	35			
	C-3	36			
4730-00-196-1468	C-6	21			
4730-00-221-2137	C-6	8			
4730-00-221-2139	C-10	2			
4730-00-231-5650	C-6	4			
6680-00-247-3273	C-2	11			
	C-2	17			
5930-00-274-5124	C-2	22			
5920-00-284-6787	C-2	53			
6680-00-435-4228	C-4	7			
	C-9	29			
5340-00-444-6468	C-9	11			
3030-00-528-4753	C-9	32			
2805-00-536-8835	C-2	24			
5340-00-543-3904	C-9	36			
4730-00-561-1544	C-9	37			
4730-00-591-0659	C-9	3			
2590-00-624-9941	C-2	23			
4330-00-629-2063	C-4	8			
4730-00-684-6914	C-7	6			
2805-00-695-1029	C-3	23			
6210-00-803-9882	C-2	51			
4330-00-804-1541	C-6	17			
5305-00-914-3784	C-6	13			
4820-00-927-7199	C-2	31			
	C-3	31			
2990-00-993-0447	C-9	17			
4320-01-108-3936	C-5	38			
2805-01-112-7760	C-8	1			
2920-01-119-9297	C-1	1			
4940-01-143-1307	C-2	21			
4920-01-191-9669	C-3	43			
4920-01-198-2306	C-3	4			
4920-01-216-3336	C-3	6			

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
88044	AN26-13		C-3	11
45681	AN6227-B8		C-3	44
81352	AN6236-3	4330-00-804-1541	C-6	17
14798	AN815-8		C-7	2
88044	AN912-10D	4730-00-194-0213	C-6	20
88044	AN912-13D	4730-00-194-0225	C-3	32
			C-3	35
			C-3	36
88044	AN912-7D	4730-00-194-0210	C-3	42
06541	A19ABC		C-6	6
86768	BF-4	4330-00-629-2063	C-4	8
91510	BJ1000-ASI		C-6	7
66289	BS-11		C-2	12
57733	D-357-X		C-2	19
81349	F02A250V5A	5920-00-284-6787	C-2	53
06004	HS11-ZL-1042-12		C-11	2
96906	MS122032	5310-00-159-6209	C-6	12
96906	MS18154-6	5305-00-914-3784	C-6	13
96906	MS20913-2S	4730-00-221-2137	C-6	8
96906	MS20913-4S	4730-00-221-2139	C-10	2
96906	MS24392D12	4730-00-684-6914	C-7	6
96906	MS25231-313	6240-00-155-8714	C-2	
14798	MS27363H1200		C-7	
96906	MS28741-12-1200		C-7	
96906	MS35210-71		C-4	
96906	MS39232-7	4730-00-231-5650	C-6	4
96906	MS39242-26	3030-00-528-4753	C-9	32
96906	MS51953-97	4730-00-196-1468	C-6	21
96906	MS75047-1	6140-00-059-3528	C-1	2
66289	MVG-4DSPEC389345	2805-01-112-7760	C-8	1
81321	P-142-16-0		C-5	35
98660	PF3110-12		C-6	22
24207	PMFFG-2001		C-2	43
			C-3	18
24207	PMFFG-2004		C-2	27
			C-2	40
			C-3	15
			C-3	37
16954	PV-06J-002-52R-0 YM-000	4320-01-108-3936	C-5	38
86768	R-6701-4		C-2	36
86768	R6701-4 3/4S2-1/ 4P		C-3	40
16754	S6-AC		C-8	2
76700	T-5080	2990-00-993-0447	C-9	17
16764	TH-89		C-2	14
72100	V-5		C-2	4
			C-6	25
66289	VE527	2805-00-536-8835	C-2	24
66289	VE693-1	2590-00-624-9941	C-2	23
66289	YC10C	5930-00-274-5124	C-2	22

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
06004	ZLA-1202-13		C-11	3
06004	ZLA1008-13	5340-00-444-6468	C-9	11
			C-11	10
81348	ZZ-T-410A/GP1/6.00/6.90-9/C/PLRB	2610-00-050-9840	C-9	7
00624	015533S11-8D		C-9	4
16954	035-12555		C-3	8
16954	035-16956		C-3	7
22938	1-3502		C-9	27
22938	1-3851		C-9	9
22938	1-5904		C-9	28
22938	1-8209		C-9	22
30327	108-HD		C-2	46
30327	108HD1-8	2805-00-695-1029	C-3	23
16764	1103164	2920-01-119-9297	C-1	1
53155	1201-PS-1		C-5	28
22938	15123		C-9	34
00624	155-S5-12D		C-7	7
00624	155-S5-8D		C-7	3
00624	155-S9-12D		C-7	8
00624	155-S9-8D		C-7	4
00624	155S11-12D	4730-00-591-0659	C-9	3
00624	155S7-12D	4730-00-561-1544	C-9	37
72100	176F-33		C-2	3
72100	177F-33		C-2	10
45681	2-366		C-6	14
30327	24SB08X04		C-3	24
30327	24SG08X04		C-3	25
22938	245-1346		C-9	24
22938	245-1936		C-9	6
22938	245-5911		C-9	5
60038	2478-1		C-9	33
22938	3712		C-9	8
57733	385-B	6680-00-435-4228	C-4	7
			C-9	29
			C-10	4
16764	40004		C-9	16
22938	4020-1		C-9	10
			C-9	23
53155	453-1/2S2-6		C-5	27
98750	48B7796		C-9	21
30327	5 0F		C-10	3
22938	5400-1		C-9	26
91816	559B-6MP-10		C-6	23
22031	5602		C-5	32
73808	6-00X9	2610-00-089-5997	C-9	1
22938	6311		C-9	35
22398	6555		C-9	1
20954	668-2003	4920-01-198-2306	C-3	4
81321	6681089		C-5	31
86768	694-1/4B		C-5	33

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	
30327	721 FS01		C-5	
53155	74-100-1		C-11	
53155	74-100-11		C-9	
			C-10	
53155	74-100-11-1		C-10	
53155	74-100-11-2		C-10	6
53155	74-100-13		C-4	1
53155	74-100-13-1		C-4	4
53155	74-100-13-2		C-4	10
53155	74-100-177		C-2	34
53155	74-100-177-1		C-3	5
53155	74-100-177-2	4920-01-216-3336	C-3	6
53155	74-100-2		C-11	6
53155	74-100-200		C-5	25
			C-6	
53155	74-100-200-1		C-6	1
53155	74-100-200-15		C-6	15
53155	74-100-200-16		C-6	16
53155	74-100-200-2		C-6	2
53155	74-100-200-9		C-6	9
53155	74-100-201-1		C-3	9
53155	74-100-201-3	4920-01-191-9669	C-3	43
53155	74-100-202		C-2	41
53155	74-100-202-1		C -3	12
53155	74-100-202-3		C-3	13
53155	74-100-204-3		C-3	10
53155	74-100-31		C-9	19
53155	74-100-51		C-2	
53155	74-100-51A		C-3	2
53155	74-100-51B		C-3	1
53155	74-100-54		C-5	42
53155	74-100-6		C-9	1
53155	74-100-602-1		C-9	18
53155	74-100-602-3		C-9	31
53155	74-100-69		C-3	3
53155	74-100-8		C-11	1
53155	74-100-8-1		C-11	4
53155	74-100-8-2		C-11	5
53155	74-100-8-3		C-11	7
53155	74-100-8-4		C-11	9
53155	74-100-9		C-5	26
53155	74-400-10		C-5	4
53155	74-400-21		C-5	1
53155	74-400-22		C-5	8
53155	74-400-3		C-5	6
53155	74-400-36		C-5	7
53155	74-400-4		C-5	2
53155	74-401-10		C-9	13
53155	74-401-12		C-5	13
53155	74-401-13		C-5	9
53155	74-401-14		C-5	16

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
53155	74-401-17		C-5	11
53155	74-401-22		C-9	15
53155	74-401-26		C-5	14
53155	74-401-36		C-5	15
53155	74-401-5		C-5	12
53155	74-401-7		C-5	9A
53155	74-401-8		C-5	24
53155	74-401-9		C-5	10
53155	74-402-14		C-5	20
53155	74-402-16		C-5	3
53155	74-402-2		C-5	44
53155	74-402-20		C-5	21
53155	74-402-21		C-5	19
53155	74-402-22		C-5	18
53155	74-402-3 3/4		C-5	5
53155	74-403-14		C-5	23
53155	74-403-34		C-5	22
53155	74TS100-10-1		C-7	
53155	74TS100-10-3		C-7	
53155	7400-1		C-2	1
53155	7400-10		C-2	15
53155	7400-11		C-2	16
53155	7400-12		C-2	18
53155	7400-13		C-2	25
53155	7400-14		C-2	28
53155	7400-15		C-2	45
53155	7400-16		C-2	47
53155	7400-17		C-2	44
53155	7400-18		C-2	42
53155	7400-19		C-2	37
53155	7400-2		C-2	2
53155	7400-20		C-2	38
53155	7400-21		C-2	49
53155	7400-22		C-2	29
53155	7400-23		C-2	30
53155	7400-24		C-2	32
53155	7400-25		C-2	33
53155	7400-26		C-2	39
53155	7400-27		C-2	35
53155	7400-3		C-2	48
53155	7400-4		C-2	5
53155	7400-5		C-2	26
53155	7400-6		C-2	13
53155	7400-7		C-2	8
53155	7400-9		C-2	9
86768	744-20D2	4820-00-927-7199	C-2	31
			C-3	31
53155	75-100-201		C-2	50
86768	751-123		C-4	6
53155	76-100-717	4940-01-143-1307	C-2	21
53155	76-400-21		C-5	

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
97576	8MPE		C-5	17
72619	806-1710-0431-50		C-2	6
72619	806-1710-0431-50 4	6210-00-803-9882	C-2	51
57733	82413	6680-00-247-3273	C-2	11
			C-2	17
22938	8300-400M		C-9	2
30327	832-FS-04		C-2	7
30327	832FS04		C-5	30
30327	841FS04		C-3	26
30327	844FS08		C-5	45
20954	845-0090		C-2	20
30327	845FS02X02		C-5	36
30327	845FS12		C-5	46
30327	845FS12X12		C-6	24
30327	848FS04X02		C-3	20
30327	848FS04X04		C-5	31
			C-5	34
30327	848FS12X08		C-4	3
			C-5	49
30327	848FS12X12		C-3	45
30327	849FS012X12		C-5	47
30327	849FS02X02		C-6	19
30327	849FS04X02		C-3	17
			C-3	19
			C-3	21
			C-3	22
30327	849FS08X08		C-3	14
			C-3	16
			C-3	27
			C-3	28
			C-3	38
			C-3	39
30327	849FS08X12		C-3	41
30327	849FS12X12		C-4	5
			C-6	18
30327	849FS16X16		C-3	29
			C-4	2
			C-6	10
30327	851FS02X02		C-5	29
30327	854FS12X12		C-3	33
			C-3	34
30327	883FS012X12		C-5	43
18876	9081170	5340-00-543-3904	C-9	36

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	FSCM	PART NUMBER
C-1	1	2920-01-119-9297	16764	1103164
C-1	2	6140-00-059-3528	96906	MS75047-1
C-2			53155	74-100-51
C-2	1		53155	7400-1
C-2	2		53155	7400-2
C-2	3		72100	176F-33
C-2	4		72100	V-5
C-2	5		53155	7400-4
C-2	6		72619	806-1710-0431-50
C-2	7		30327	832-FS-04
C-2	8		53155	7400-7
C-2	9		53155	7400-9
C-2	10		72100	177F-33
C-2	11	6680-00-247-3273	57733	82413
C-2	12		66289	BS-11
C-2	13		53155	7400-6
C-2	14		16764	TH-89
C-2	15		53155	7400-10
C-2	16		53155	7400-11
C-2	17	6680-00-247-3273	57733	82413
C-2	18		53155	7400-12
C-2	19		57733	D-357-X
C-2	20		20954	845-0090
C-2	21	4940-01-143-1307	53155	76-100-717
C-2	[illegible]	5930-00-274-5124	66289	YC10C
C-2	[illegible]	2590-00-624-9941	66289	VE693-1
C-2	[illegible]	2805-00-536-8835	66289	VE527
C-2	25		53155	7400-13
C-2	26		53155	7400-5
C-2	27		24207	PMFFG-2004
C-2	28		53155	7400-14
C-2	29		53155	7400-22
C-2	30		53155	7400-23
C-2	31	4820-00-927-7199	86768	744-20D2
C-2	32		53155	7400-24
C-2	33		53155	7400-25
C-2	34		53155	74-100-177
C-2	35		53155	7400-27
C-2	36		86768	R-6701-4
C-2	37		53155	7400-19
C-2	38		53155	7400-20
C-2	39		53155	7400-26
C-2	40		24207	PMFFG-2004
C-2	41		53155	74-100-202
C-2	42		53155	7400-18
C-2	43		24207	PMFFG-2001
C-2	44		53155	7400-17
C-2	45		53155	7400-15
C-2	46		30327	108-HD
C-2	47		53155	7400-16
C-2	48		53155	7400-3

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	FSCM	PART NUMBER
C-2	49		53155	7400-21
C-2	50		53155	75-100-201
C-2	51	6210-00-803-9882	72619	806-1710-0431-504
C-2	52	6240-00-155-8714	96906	MS25231-313
C-2	53	5920-00-284-6787	81349	F02A250V5A
C-3	1		53155	74-100-51B
C-3	2		53155	74-100-51A
C-3	3		53155	74-100-69
C-3	4	4920-01-198-2306	20954	668-2003
C-3	5		53155	74-100-177-1
C-3	6	4920-01-216-3336	53155	74-100-177-2
C-3	7		16954	035-16956
C-3	8		16954	035-12555
C-3	9		53155	74-100-201-1
C-3	10		53155	74-100-204-3
C-3	11		88044	AN26-13
C-3	12		53155	74-100-202-1
C-3	13		53155	74-100-202-3
C-3	14		30327	849FS08X08
C-3	15		24207	PMFFG-2004
C-3	16		30327	849FS08X08
C-3	17		30327	849FS04X02
C-3	18		24207	PMFFG-2001
C-3	19		30327	849FS04X02
C-3	20		30327	848FS04X02
C-3	21		30327	849FS04X02
C-3	22		30327	849FS04X02
C-3	23	2805-00-695-1029	30327	108HD1-8
C-3	24		30327	24SB08X04
C-3	25		30327	24SG08X04
C-3	26		30327	841FS04
C-3	27		30327	849FS08X08
C-3	28		30327	849FS08X08
C-3	29		30327	849FS16X16
C-3	31	4820-00-927-7199	86768	744-20D2
C-3	32	4730-00-194-0225	88044	AN912-13D
C-3	33		30327	854FS12X12
C-3	34		30327	854FS12X12
C-3	35	4730-00-194-0225	88044	AN912-13D
C-3	36	4730-00-194-0225	88044	AN912-13D
C-3	37		24207	PMFFG-2004
C-3	38		30327	849FS08X08
C-3	39		30327	849FS08X08
C-3	40		86768	P6701-4 3/4S2-1/4P
C-3	41		30327	849FS08X12
C-3	42	4730-00-194-0210	88044	AN912-7D
C-3	43	4920-01-191-9669	53155	74-100-201-3
C-3	44		45681	AN6227-B8
C-3	45		30327	848FS12X12

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	FSCM	PART NUMBER
C-4	1		53155	74-100-13
C-4	2		30327	849FS16X16
C-4	3		30327	848FS12X08
C-4	4		53155	74-100-13-1
C-4	5		30327	849FS12X12
C-4	6		86768	751-123
C-4	7	6680-00-435-4228	57733	385-B
C-4	8	4330-00-629-2063	86768	BF-4
C-4	9		96906	MS35210-71
C-4	10		53155	74-100-13-2
C-5			53155	76-400-21
C-5	1		53155	74-400-21
C-5	2		53155	74-400-4
C-5	3		53155	74-402-16
C-5	4		53155	74-400-10
C-5	5		53155	74-402-3 3/4
C-5	6		53155	74-400-3
C-5	7		53155	74-400-36
C-5	8		53155	74-400-22
C-5	9		53155	74-401-13
C-5	9A		53155	74-401-7
C-5	10		53155	74-401-9
C-5	11		53155	74-401-17
C-5	12		53155	74-401-5
C-5	13		53155	74-401-12
C-5	14		53155	74-401-26
C-5	15		53155	74-401-36
C-5	16		53155	74-401-14
C-5	17		97576	8MPE
C-5	18		53155	74-402-22
C-5	19		53155	74-402-21
C-5	20		53155	74-402-14
C-5	21		53155	74-402-20
C-5	22		53155	74-403-34
C-5	23		53155	74-403-14
C-5	24		53155	74-401-8
C-5	25		53155	74-100-200
C-5	26		53155	74-100-9
C-5	27		53155	453-1/2S2-6
C-5	28		53155	1201-PS-1
C-5	29		30327	851FS02X02
C-5	30		30327	832FS04
C-5	31		30327	848FS04X04
C-5	32		22031	5602
C-5	33		86768	694-1/4B
C-5	34		30327	848FS04X04
C-5	35		81321	P-142-16-0
C-5	36		30327	845FS02X02
C-5	37		81321	6681089
C-5	38	4320-01-108-3936	16954	PV-06J-002-52R-0 YM-000

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG.	ITEM	STOCK NUMBER	FSCM	PART NUMBER
C-5	42		53155	74-100-54
C-5	43		30327	883FS012X12
C-5	44		53155	74-402-2
C-5	45		30327	844FS08
C-5	46		30327	845FS12
C-5	47		30327	849FS012X12
C-5	48		30327	721FS01
C-5	49		30327	848FS12X08
C-6			53155	74-100-200
C-6	1		53155	74-100-200-1
C-6	2		53155	74-100-200-2
C-6	4	4730-00-231-5650	96906	MS39232-7
C-6	6		06541	A19ABC
C-6	7		91510	BJ1000-ASI
C-6	8	4730-00-221-2137	96906	MS20913-2S
C-6	9		53155	74-100-200-9
C-6	10		30327	849FS16X16
C-6	12	5310-00-159-6209	96906	MS122032
C-6	13	5305-00-914-3784	96906	MS18154-6
C-6	14		45681	2-366
C-6	15		53155	74-100-200-15
C-6	16		53155	74-100-200-16
C-6	17	4330-00-804-1541	81352	AN6236-3
C-6	18		30327	849FS12X12
C-6	19		30327	849FS02X02
C-6	20	4730-00-194-0213	88044	AN912-10D
C-6	21	4730-00-196-1468	96906	MS51953-97
C-6	22		98660	PF3110-12
C-6	23		91816	559B-6MP-10
C-6	24		30327	845FS12X12
C-6	25		72100	V-5
C-7			53155	74TS100-10-1
C-7			53155	74TS100-10-3
C-7	1		14798	MS27363H1200
C-7	2		14798	AN815-8
C-7	3		00624	155-S5-8D
C-7	4		00624	155-S9-8D
C-7	5		96906	MS28741-12-1200
C-7	6	4730-00-684-6914	96906	MS24392D12
C-7	7		00624	155-S5-12D
C-7	8		00624	155-S9-12D
C-8	1	2805-01-112-7760	66289	MVG-4DSPEC389345
C-8	2		16754	S6-AC
C-9	1		53155	74-100-6
C-9	2		22938	8300-400M
C-9	3	4730-00-591-0659	00624	155S11-12D
C-9	4		00624	015533S11-8D
C-9	5		22938	245-5911
C-9	6		22938	245-1936
C-9	7		22398	6555
C-9	7	2610-00-050-9840	81348	ZZ-T-410A/GP1/6.00/6.90-9/C/PLRB

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

	ITEM	STOCK NUMBER	FSCM	PART NUMBER
C-9	7	2610-00-089-5997	73808	6-00X9
C-9	8		22938	3712
C-9	9		22938	1-3851
C-9	10		22938	4020-1
C-9	11	5340-00-444-6468	06004	ZLA1008-13
C-9	13		53155	74-401-10
C-9	15		53155	74-401-22
C-9	16		16764	40004
C-9	17	2990-00-993-0447	76700	T-5080
C-9	18		53155	74-100-602-1
C-9	19		53155	74-100-31
C-9	21		98750	48B7796
C-9	22		22938	1-8209
C-9	23		22938	4020-1
C-9	24		22938	245-1346
C-9	25		53155	74-100-11
C-9	26		22938	5400-1
C-9	27		22938	1-3502
C-9	28		22938	1-5904
C-9	29	6680-00-435-4228	57733	385-B
C-9	31		53155	74-100-602-3
C-9	32	3030-00-528-4753	96906	MS39242-26
C-9	33		60038	2478-1
C-9	34		22938	15123
C-9	35		22938	6311
C-9	36	5340-00-543-3904	18876	9081170
C-9	37	4730-00-561-1544	00624	155S7-12D
C-10	1		53155	74-100-11
C-10	2	4730-00-221-2139	96906	MS20913-4S
C-10	3		30327	50F
C-10	4		57733	385-B
C-10	5		53155	74-100-11-1
C-10	6		53155	74-100-11-2
C-11	1		53155	74-100-8
C-11	2		06004	HS11-ZL-1042-12
C-11	3		06004	ZLA-1202-13
C-11	4		53155	74-100-8-1
C-11	5		53155	74-100-8-2
C-11	6		53155	74-100-2
C-11	7		53155	74-100-8-3
C-11	8		53155	74-100-1
C-11	9		53155	74-100-8-4
C-11	10		06004	ZLA1008-13

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM 55-4920-384-13&P	30 May 80	Operator, AVUM, AVIM Maintenance Manual including RPSTL for Gasoline Engine Driven Hyd Sys Test Stand D-5

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
6	2-1 a		
81		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders

Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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TM 55-4920-384-13&P	30 May 80	Operator, AVUM, AVIM Maintenance Manual including RPSTL for Gasoline Engine Driven Hyd Sys Test Stand D6C

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REVERSE OF DA FORM 2028-2

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers - 3,280.8 feet

Weights

1 centigram = 10 milligrams - .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 38.82 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 10 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	3.94
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C