



FORD TRACTOR

shop manual

CM082702

TRACTOR AND IMPLEMENT DIVISION

Ford Motor Company

FORD TRACTOR SHOP MANUAL

for

TRACTOR SERIES

600-700-800-900

601-701-801-901-1801

Copyright 1961

Ford Motor Company

Prepared by

TRACTOR AND IMPLEMENT DIVISION

FORD MOTOR COMPANY

FOREWORD

This manual contains complete service information on all Series 600 through 1801 Ford Tractors. The information contained herein will be useful to the inexperienced mechanics as well as the experienced ones.

Step-by-step procedures for removal, disassembly, inspection, repair, assembly, and installation are presented throughout the manual. Most of the major assemblies are shown disassembled, with each of the component parts arranged in the order of assembly. In many instances, a glance at the disassembled views will show you everything you need to know to assemble the parts.

Whenever possible, the special tools involved in the disassembly or assembly of the various units are illustrated.

Sections on Trouble Shooting, Specifications, and Special Tools are provided at the end of each chapter for quick reference.

The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. The Tractor and Implement Division of Ford Motor Company reserves the right to discontinue at any time, or change specifications or design without notice or without incurring obligation.

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
SERVICE DEPARTMENT

TABLE OF CONTENTS

Part ONE—POWER PLANT

Chapter I—ENGINE

Section	Page	Section	Page
1 Engine Removal and Installation— Series 501 through 901.....	1	6 Main Bearings, Balancer, Flywheel, and Crankshaft	32
2 Engine Removal and Installation—Series 1801.....	8	7 Engine Governor and Timing Gear Cover.....	39
3 Cylinder Head and Valves.....	12	8 Camshaft and Camshaft Gear.....	41
4 Oil Pan, Oil Pump, and Oil Filter.....	20	9 Engine Tune-Up.....	43
5 Connecting Rods, Bearings, Pistons, Rings, and Cylinder Block.....	25	10 Trouble Shooting.....	46
		11 Specifications.....	52
		12 Special Tools.....	57

Chapter II—ELECTRICAL SYSTEM

Section	Page	Section	Page
1 Battery.....	60	5 Manifold Heaters, Relay and Electrical Circuit—DIESEL.....	75
2 Generator and Charging Circuit.....	61	6 Trouble Shooting.....	76
3 Starting Motor, Solenoid and Starting Circuit.....	69	7 Specifications.....	82
4 Lamps and Lighting Circuit.....	73	8 Special Tools.....	82

Chapter III—IGNITION SYSTEM

Section	Page	Section	Page
1 Ignition Switch.....	83	5 Trouble Shooting.....	92
2 Spark Plugs and Ignition Wires.....	84	6 Specifications.....	95
3 Coil.....	84	7 Special Tools.....	96
4 Distributor.....	85		

Chapter IV—FUEL AND EXHAUST SYSTEM—GASOLINE

Section	Page	Section	Page
1 Air Cleaner.....	97	5 Trouble Shooting.....	107
2 Carburetor.....	99	6 Specifications.....	108
3 Fuel Tank, Sediment Bowl and Lines.....	103	7 Special Tools.....	108
4 Manifold, Muffler, and Exhaust Pipe.....	104		

Chapter V—FUEL AND EXHAUST SYSTEM—DIESEL

Section	Page	Section	Page
1 Air Cleaner.....	109	7 Fuel Injection Pump.....	118
2 Fuel Tank.....	110	8 Manifold, Muffler, and Outlet Pipe.....	120
3 Bleeding and Flushing the Fuel System.....	110	9 Trouble Shooting.....	122
4 Idle and High Speed Adjustments.....	111	10 Specifications.....	124
5 Fuel Filter.....	112	11 Special Tools.....	124
6 Fuel Injectors.....	113		

Chapter VI—FUEL AND EXHAUST SYSTEM—LP-GAS

Section	Page	Section	Page
1 Construction	125	7 Fuel Filter	139
2 Principles of Operation	128	8 Pressure Regulators and Vaporizer	140
3 Handling of LP-Gas	130	9 Trouble Shooting	148
4 Air Cleaner	131	10 Specifications	149
5 Carburetors	131	11 Special Tools	149
6 Fuel Tank, Valves and Lines	137		

Chapter VII—COOLING SYSTEM

Section	Page	Section	Page
1 Care of the Cooling System	150	5 Fan and Generator Belt	155
2 Radiator, Hose, and Pressure Cap	151	6 Trouble Shooting	155
3 Water Pump	153	7 Specifications	157
4 Thermostat	154	8 Special Tools	157

Part TWO—CLUTCH, TRANSMISSIONS, REAR AXLE, AND POWER TAKE-OFF

Chapter I—CLUTCH

Section	Page	Section	Page
1 Single Clutch	158	5 Clutch Pedal Adjustment	165
2 Double Clutch	161	6 Trouble Shooting	166
3 Clutch Release Shaft Bushings	165	7 Specifications	166
4 Clutch Pedal Bushings	165	8 Special Tools	167

Chapter II—TRANSMISSIONS

Section	Page	Section	Page
1 Removal and Installation	168	7 Description and Operation	
2 Cleaning and Inspection— All except Select-O-Speed	170	Select-O-Speed Transmission	197
3 Four Speed Transmission	170	8 Maintenance and Adjustments	217
4 Five Speed Transmission	177	9 Transmission Overhaul	224
5 Sherman Step-Up and Step-Down Transmission	188	10 Trouble Shooting—Select-O-Speed Transmission	249
6 Sherman Reversing Transmission	193	11 Specifications	254
		12 Special Tools	257

Chapter III—REAR AXLE

Section	Page	Section	Page
1 General Purpose and Industrial Tractors	258	4 Specifications	272
2 Row Crop Tractors	266	5 Special Tools	272
3 Center Housing Replacement	270		

Chapter IV—POWER TAKE-OFF

Section	Page	Section	Page
1 Power Take-Off	273	4 Specifications	281
2 Power Take-Off Conversion Assembly	277	5 Special Tools	281
3 Belt Pulley	278		

Part THREE—STEERING, FRONT AXLE, BRAKES, WHEELS AND TIRES

Chapter IA—POWER STEERING—GENERAL PURPOSE TRACTORS

Section	Page	Section	Page
1 Construction and Operation.....	282	5 Power Cylinder.....	299
2 Drag Link.....	287	6 Trouble Shooting.....	300
3 Power Steering Pump—Sleeve Type.....	288	7 Specifications.....	300
4 Control Valve and Steering Gear.....	292	8 Special Tools.....	300

Chapter IB—POWER STEERING—ROW CROP TRACTORS

Section	Page	Section	Page
1 Construction and Operation.....	301	5 Power Cylinder and Control Valve Assembly.....	316
2 Drag Link.....	306	6 Trouble Shooting.....	322
3 Power Steering Pump—Rotor Type.....	307	7 Specifications.....	322
4 Steering Gear.....	310	8 Special Tools.....	322

Chapter IC—POWER STEERING—INDUSTRIAL TRACTORS

Section	Page	Section	Page
1 Construction and Operation.....	323	5 Control Cable and Conduit Assembly.....	336
2 Power Steering Pump.....	327	6 Trouble Shooting.....	338
3 Power Cylinder and Valve End Assembly.....	329	7 Specifications.....	340
4 Actuator Housing.....	334	8 Special Tool.....	340

Chapter II—FRONT AXLE

Section	Page	Section	Page
1 General Purpose Front Axle— Standard and Heavy Duty.....	341	5 Industrial Front Axle.....	355
2 Row Crop Front Axles.....	346	6 Specifications.....	360
3 Row Crop Pedestal.....	348	7 Trouble Shooting.....	361
4 Row Crop Wide Adjustable Front Axle.....	353	8 Special Tools.....	361

Chapter III—BRAKES

Section	Page	Section	Page
1 Brake Adjustment.....	362	3 Brake Camshaft.....	366
2 Pedals, Shafts and Brake Rods.....	363	4 Brake Overhaul.....	366

Chapter IV—WHEELS AND TIRES

Section	Page	Section	Page
1 Wheel Bearing.....	368	4 Tires.....	377
2 Wheel Spacing—Tread Width.....	368	5 Specifications.....	378
3 Wheel Weights.....	374	6 Special Tools.....	379

Part FOUR—HYDRAULIC SYSTEM

Chapter I—OPERATING PRINCIPLES

Section	Page
1 Operating Principles.....	381

Chapter II—ADJUSTMENTS, COMPONENT PARTS, TROUBLE SHOOTING AND SPECIAL TOOLS

Section	Page	Section	Page
1 Hydraulic Control Adjustment.....	387	6 Pump Relief Valve and Oil Tubes.....	408
2 Leveling Box.....	388	7 Trouble Shooting.....	409
3 Lift Cover.....	389	8 Specifications.....	414
4 Lift Cylinder.....	394	9 Special Tools.....	414
5 Hydraulic Pump and Manifold.....	396		

Part FIVE—MAINTENANCE AND LUBRICATION

Section	Page	Section	Page
1 Maintenance.....	415	2 Lubrication.....	415

Part ONE

POWER PLANT

Chapter I Engine

Section	Page
1 Engine Removal and Installation—Series 501 through 901	1
2 Engine Removal and Installation—Series 1801	8
3 Cylinder Head and Valves	12
4 Oil Pan, Oil Pump and Oil Filter	20
5 Connecting Rods, Bearings, Pistons, Rings and Cylinder Block	25
6 Main Bearings, Balancer, Flywheel and Crankshaft	32
7 Engine Governor and Timing Gear Cover	39
8 Camshaft and Camshaft Gear	41
9 Engine Tune-Up	43
10 Trouble Shooting	46
11 Specifications	52
12 Special Tools	57

1. ENGINE REMOVAL AND INSTALLATION—SERIES 501 THROUGH 901

There are three different size engines used in Ford Tractors. The smallest engine of the three has a 134 cubic inch displacement and is available as a gasoline or LP-Gas model. The next larger size has a 144 cubic inch displacement and is available only as a diesel model. The largest of the three has a 172 cubic inch displacement and models are available for gasoline, LP-Gas or diesel operation.

All Ford Tractor engines are of the four cylinder, four cycle, overhead valve type.

When necessary to remove or install an engine, refer to the specific series tractor involved.

PREPARING THE TRACTOR

A. Series 501-701-901 Gasoline or LP-Engines

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On tractors equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.

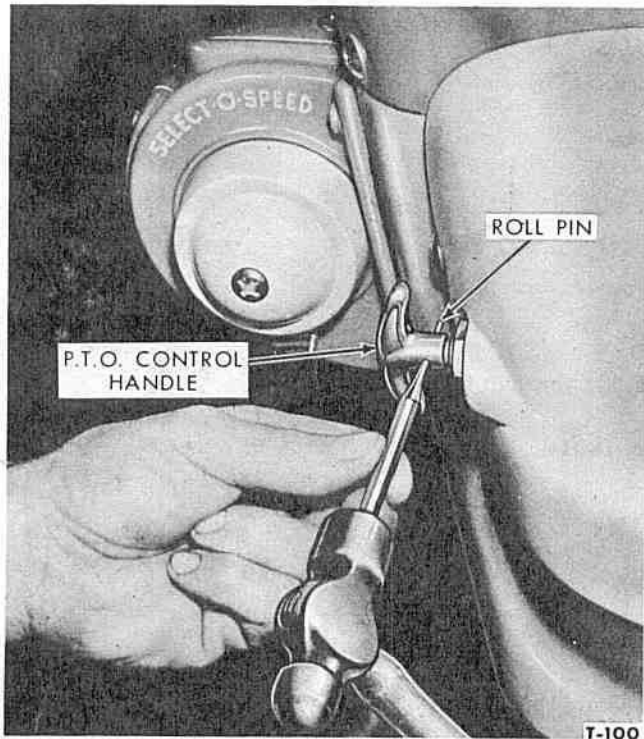


Figure 1—Removing P.T.O. Control Handle

4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank gauge.
5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the two bolts from each hood side front lower panel flange.

501 Series Tractor: Loosen the three bolts that attach the steering shaft support to the transmission to provide clearance for removing the hood.

6. Loosen the clamps that secure the air cleaner tube to the carburetor and the air cleaner. Remove the air cleaner tube.
7. With an assistant, carefully lift the hood from the tractor.

NOTE: On tractors equipped with a Select-O-Speed transmission, make certain that the P.T.O. control cable is clear of the hood.

8. Remove the two air cleaner attaching screws and remove the air cleaner. Remove the bolt that attaches the fuel tank support to the left side of the battery support. On tractors equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that

attach the muffler outlet pipe front support to the fuel tank front support bracket.

Gasoline Engine: Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line at the fuel filter, see Figure 3. Remove the bolts that attach the fuel tank support brackets to the cylinder block. Remove the one nut that attaches the fuel tank front support bracket to the cylinder block. With an assistant, carefully lift the fuel tank and brackets from the tractor.

LP-Gas Engine: Turn the fuel withdrawal valves to the closed position. Disconnect the flexible hose at the vaporizer inlet connection. Disconnect the water temperature gauge line and the oil pressure gauge line from the cable clip bracket at the right rear side of the fuel tank. Remove the four bolts that attach the fuel tank support brackets to the cylinder block. With an assistant, carefully lift the tank, heat shields and support brackets from the tractor.

B. Series 501-701-901 Diesel Engine

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On a tractor equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank gauge.
5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the bolts from each side of the hood lower panel flange. With an assistant, carefully lift the hood from the tractor.

NOTE: On a tractor equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.

6. Loosen the clamp that connects the air cleaner tube to the air cleaner. Disconnect the clamp that attaches the air cleaner tube to the bracket on the left side of the hood rear lower panel and remove the tube. If the engine is equipped with a pre-cleaner, remove the vertical stack in place of the tube.

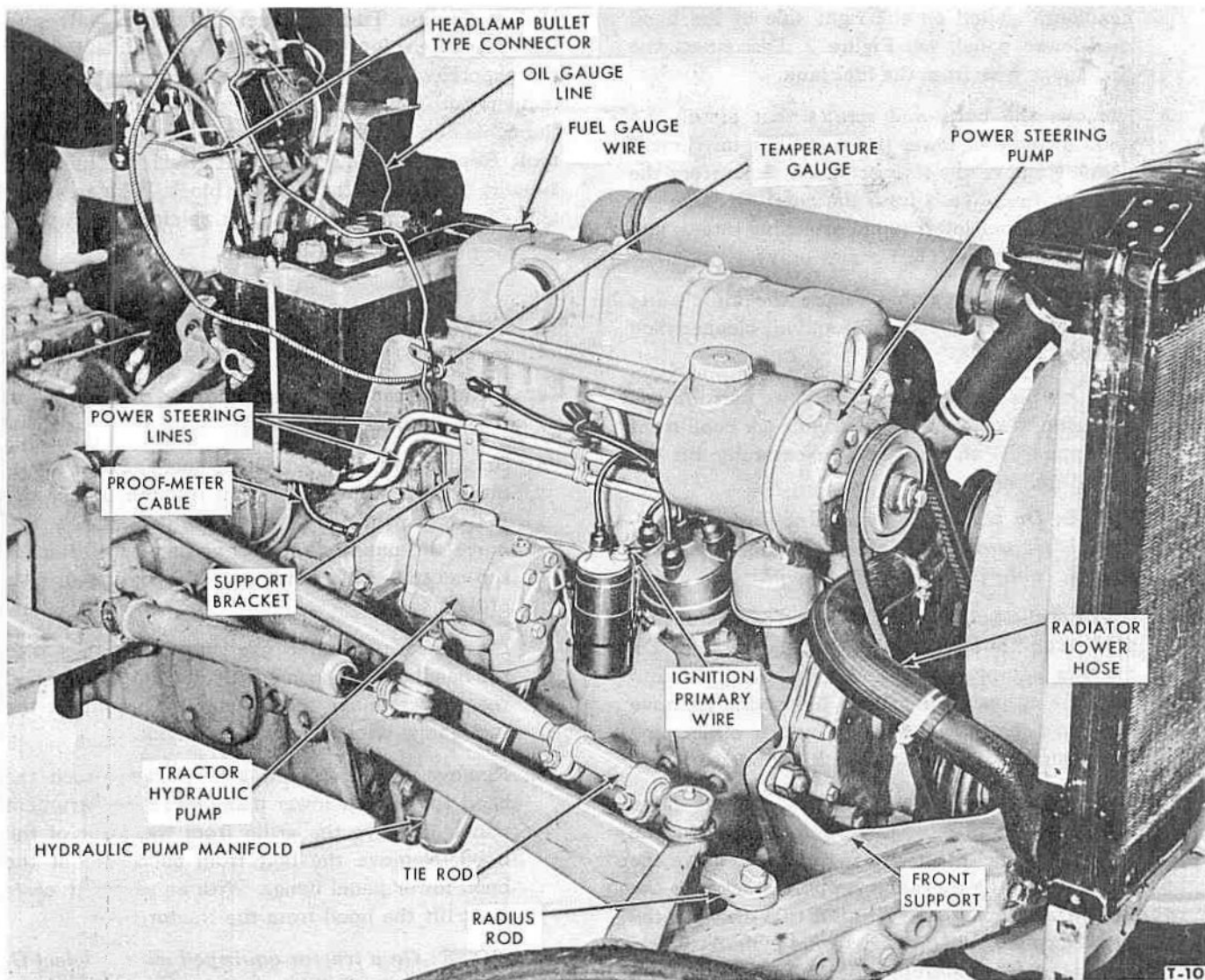


Figure 2—Right Side of Engine

7. On a tractor equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank front support bracket.
8. Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line from the tank and from the fuel filter. Disconnect the excess fuel return line from the forward end of the fuel tank and from the "T" connection on the right side of the cylinder block.
9. Place a piece of wood across the top of the battery to prevent the fuel tank from accidentally contacting the battery posts. Remove nut and lock washer that attaches the fuel tank front support to the cylinder block. Remove the four fuel tank support attaching bolts. With an assis-

tant, carefully lift the fuel tank and support brackets from the tractor.

10. Remove the battery from the battery tray.

C. Series 601-801 Gasoline Engine

1. Disconnect the battery ground strap.
2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
3. On tractors equipped with a Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
4. Disconnect the bullet connector adjacent to the

headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank.

5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the four attaching bolts from the grille and remove it from the hood. Remove the two hood front lower panel attaching screws and remove the panel (801 series only).
6. Loosen the clamps that secure the air cleaner tube hoses to the carburetor and air cleaner then remove the tube.
7. Remove the grille attaching screws and remove the grille. Remove the bolt from each hood front side panel. With an assistant, carefully lift the hood from the tractor.

NOTE: *On tractors equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.*

8. Remove the bolt that attaches the fuel tank support to the left side of the battery support. On tractors equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank support bracket.

Gasoline Engine: Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line at the fuel filter, see Figure 3. Remove the bolts that attach the fuel tank support bracket to the cylinder block. Remove the one nut that attaches the fuel tank front support bracket to the cylinder block. With an assistant, carefully lift the fuel tank and support brackets from the tractor.

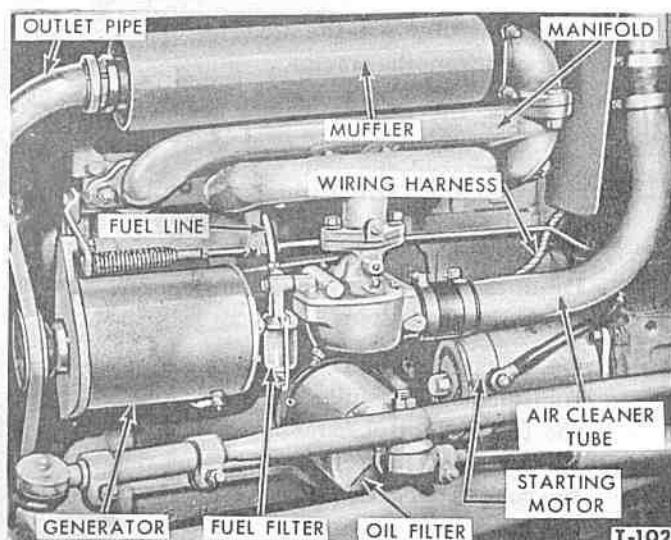


Figure 3—Left Side of Engine

LP-Gas Engine: Turn the fuel withdrawal valves to the closed position. Disconnect the flexible hose at the vaporizer inlet connection. Disconnect the water temperature gauge line and the oil pressure line from the cable clip bracket at the right rear side of the fuel tank. Remove the four bolts that attach the fuel tank support brackets to the cylinder block. With an assistant, carefully lift the tank, heat shields and support brackets from the tractor.

D. Series 601-801 Diesel

1. Disconnect the battery ground strap.
 2. Drain the radiator, cylinder block, crankcase and the hydraulic system.
 3. On a tractor equipped with Select-O-Speed transmission, carefully drive the roll pin out of the P.T.O. control handle as shown in Figure 1. Remove the handle, nut and washer that attaches the control cable housing to the right rear side of the hood.
 4. Disconnect the bullet type connector adjacent to the headlamp switch on the right side of the hood rear lower panel, see Figure 2. Disconnect the fuel gauge wire from the fuel tank.
 5. Remove the bolts and screws that attach the hood to the rear lower panel and the instrument panel. Remove the grille from the front of the hood. Remove the bolt from each side of the hood lower panel flange. With an assistant, carefully lift the hood from the tractor.
- NOTE:** *On a tractor equipped with a Select-O-Speed transmission, make certain that the P.T.O. cable is clear of the hood.*
6. Loosen the clamp that connects the air cleaner tube to the air cleaner. Disconnect the clamp that attaches the air cleaner tube to the bracket on the left side of the hood lower panel and remove the tube.
 7. On a tractor equipped with power steering, disconnect the adjusting link from the pump. Remove the two bolts that attach the muffler outlet pipe front support to the fuel tank front support bracket.
 8. Turn the fuel tank shut-off valve clockwise as far as possible to close it. Disconnect the fuel line from the tank and from the filter. Disconnect the excess fuel return line from the forward end of the fuel tank and from the "T" connection on the right side of the cylinder block.
 9. Place a piece of wood across the top of the bat-

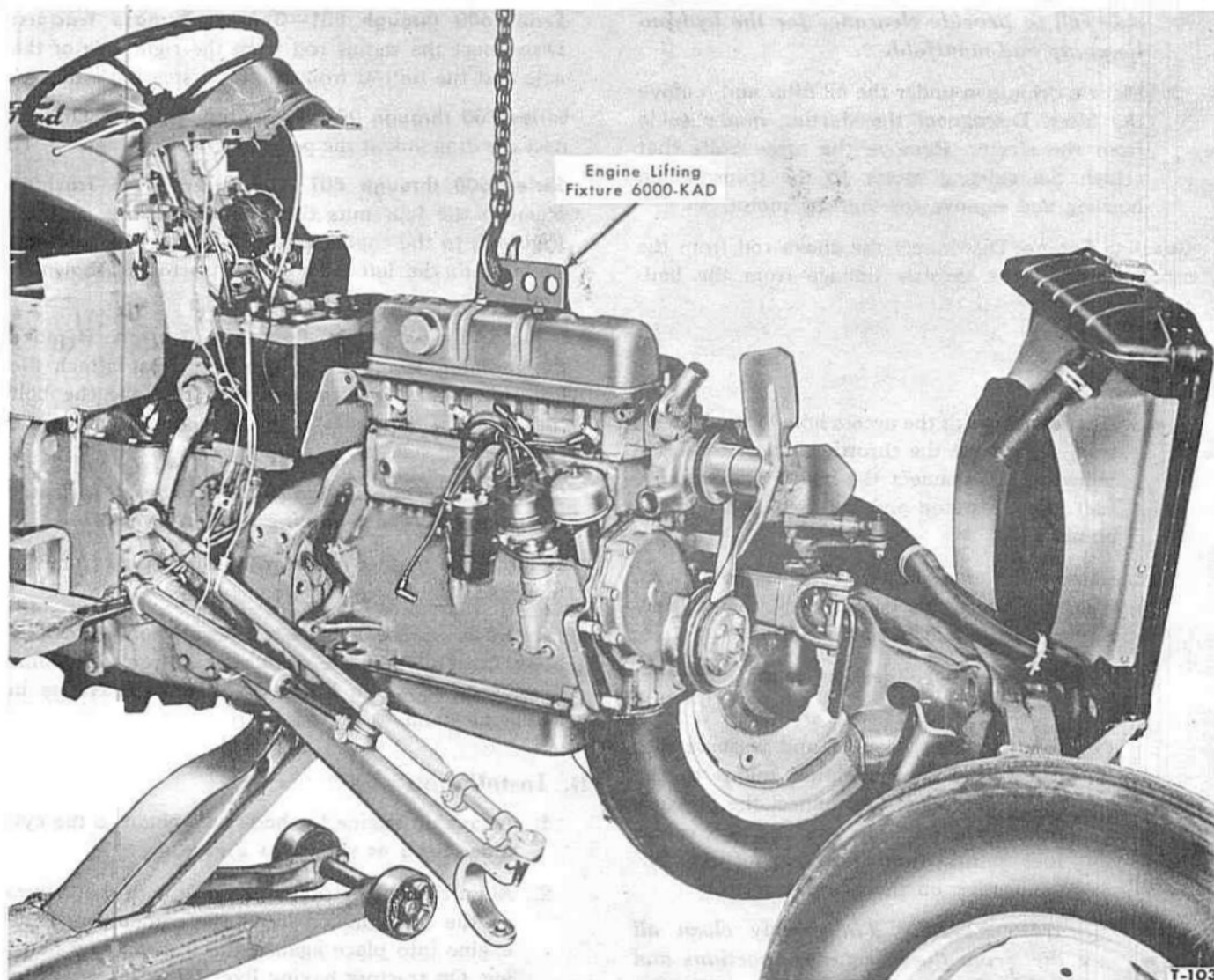


Figure 4—Removing Engine

tery to prevent the fuel tank from accidentally contacting the battery posts. Remove the nut and lock washer that attaches the fuel tank front support to the cylinder block. Remove the four fuel tank support attaching bolts. With an assistant, carefully lift the fuel tank and support brackets from the tractor.

10. Remove the battery from the battery tray.

ENGINE REMOVAL AND INSTALLATION

A. Engine Removal

Power Steering: Disconnect the two hydraulic lines that connect the pump to the steering gear as shown in Figure 2. Remove the bolt that attaches the power steering hydraulic lines support bracket to the valve

cover. Disconnect the spark plug wires from the plugs. Remove the bolts, attaching the power steering pump mounting bracket to the cylinder block and water outlet connection. Remove the pump, mounting bracket and the two hydraulic lines as an assembly.

1. Disconnect the temperature gauge unit from the engine. Disconnect the radiator hoses from the engine. Disconnect the Proof-Meter cable from the hydraulic pump. Disconnect the primary wire from the ignition coil. Place a drain pan under the hydraulic pump and manifold assembly. Remove the five bolts that attach the pump and manifold to the engine and transmission and remove as an assembly. Disconnect the oil gauge line from the fitting in the cylinder block.

NOTE: Row Crop Models: *Remove the right*

side rail to provide clearance for the hydraulic pump and manifold.

2. Place a drain pan under the oil filter and remove the filter. Disconnect the starting motor cable from the starter. Remove the three bolts that attach the starting motor to the transmission housing and remove the starting motor.

Gasoline Engine: Disconnect the choke rod from the carburetor and the throttle linkage from the bellcrank.

Diesel Engines:

- a. Working through the access hole in the battery tray, disconnect the throttle linkage from the bellcrank. Disconnect the rod connecting the fuel injector pump and bellcrank at the bellcrank.
- b. Loosen the two battery rear support bolts. Pivot the tray upwards and back, then tighten the bolts to hold it in this position.
- c. Remove the fuel injection pump and fuel filter as follows:
 - (1) Remove the two nuts and washers that attach the fuel injection pump to the mounting flange. Disconnect the pressure lines from the injectors and the excess fuel return from the rear of the "T" connection on the cylinder head.

IMPORTANT: *Thoroughly clean all dirt from the injector connections and from the pump mounting flange before disconnecting.*

Cap the injector inlets and lines to prevent dirt from entering. Minute particles of dirt can cause malfunction of the injectors as well as seizure of the pump.

- (2) Remove the two bolts that attach the fuel filter bracket to the cylinder head. Place a drain pan under the injection pump. Lift the injection pump with drive shaft, pressure lines and fuel filter from the engine as a unit.

IMPORTANT: *When removing the injection pump, make certain that the shaft remains in the pump to prevent fuel from leaking down into the crankcase.*

3. Install an engine lifting hook or chain to support the engine.

Series 600 through 801—General Purpose Tractors: Disconnect the radius rod from the right side of the axle and the tie rod from the right steering arm.

Series 700 through 901—Row Crop Tractors: Disconnect the drag link at the pedestal.

Series 600 through 801—General Purpose Tractors: Remove the four nuts that attach the axle support, Figure 2, to the engine. Carefully swing the axle and radiator to the left side of the tractor as shown in Figure 4.

Series 700 through 901—Row Crop Tractors: Remove the radiator. Remove the two bolts that attach the left side rail to the transmission. Remove the bolt that attaches the pedestal to the engine. Remove the pedestal and side rail as an assembly.

CAUTION: *Make certain that the pedestal is firmly supported before removing it from the engine.*

Remove the muffler and muffler outlet pipe from the manifold as an assembly.

4. Remove the engine-to-transmission attaching bolts. Carefully lift the engine away from the transmission as shown in Figure 4. Mount the engine in an engine stand.

B. Installation

1. Attach an engine lift hook or a chain to the cylinder head as shown in Figure 4.
2. Align the hub of the clutch disc with the splines on the transmission input shaft, then move the engine into place against the transmission housing. On tractors having live P.T.O. clutches, the P.T.O. shaft at the rear of the center housing should be turned slowly to engage the splines with the clutch discs.
3. Secure the engine to the transmission with two bolts at each side of the housing. Install the muffler and outlet pipe in place on the manifold, see Figure 3.

Series 600 through 801—General Purpose Tractors: Swing the axle support into place on the engine. Make certain that the radius rod is in place on the axle then install the four nuts that attach the front support to the engine, see Figure 2. Install the radius rod to axle attaching bolt. Connect the tie rod to the steering arm.

Series 700 through 901—Row Crop Tractors: Carefully move the pedestal and side rail assembly into position and install pedestal to engine mounting nut finger tight. Install the left side rail to transmission attaching bolts then tighten the pedestal to engine mounting

nut. Install the radiator and connect the drag link to the steering spindle arm. Connect the radiator upper and lower hoses.

4. Install the remaining engine-to-transmission retaining bolts. Remove the engine lifting sling and the jack from under the transmission.
5. Connect the oil pressure gauge line to the fitting on the right side of the cylinder block. Using new "O" rings, install the hydraulic pump and manifold on the engine.

Series 700 through 901 (Row Crop) Tractors: Install the right side rail.

6. Connect the water temperature gauge line to the engine. Connect the Proof-Meter cable to the hydraulic pump, see Figure 2.

Diesel Engines: Loosen the battery rear support bolts and lower the tray into position, then tighten the bolts. Working through the opening in the battery tray, connect the throttle control rod between the injector pump and the bellcrank. Connect the rod from the throttle control lever arm to the bellcrank. Install the battery and connect the negative cable only.

7. Position the wiring harness, see Figure 3, in the attaching clips on the cylinder block and connect the three wires to the generator.

Gasoline Engine: Connect the choke control rod to the carburetor and the throttle rod to the bellcrank. Connect the primary wire to the ignition coil.

8. Position the starting motor on the engine rear cover plate and secure with three bolts.

NOTE: *Make sure the choke control rod bracket is in place when installing the starting motor inner attaching bolt (gasoline engine only).*

Connect the starting motor cable to the starting motor.

9. Install a new oil filter or cartridge.
10. On a tractor equipped with power steering, hold the pump and lines in place on the engine and install the two pump mounting bolts. Connect the two hydraulic lines to the steering gear (600 through 801 Series). Connect the hydraulic line bracket to the valve cover with the attaching bolt, see Figure 2.
11. Install the fan belt and adjust the generator to permit $\frac{1}{4}$ " deflection of the belt.
12. Position the power steering drive belt over the

crankshaft pulley and over the power steering pump pulley.

13. Place a piece of wood across the top of the battery to prevent the fuel tank from accidentally contacting the battery posts. With an assistant, carefully lift the fuel tank and supports into place on the engine then install the nut and lock washer that secures the front support to the cylinder block. Install the four attaching bolts. Connect the fuel line to the fuel filter. Open the fuel shut-off valve.

NOTE: *If the engine is equipped with power steering, the right front fuel tank support bolt also connects to the power steering pump bracket.*

If equipped with power steering, connect the power steering pump adjusting link to the pump. Adjust the turnbuckle to obtain $\frac{1}{4}$ " belt deflection midway between the pulleys.

Diesel Engine:

- a. Make certain that the fuel injection pump drive gear and the flywheel are properly positioned as detailed in Chapter V.
 - b. Position the fuel injection pump, fuel filter and pressure lines into place as an assembly. Install the two injection pump attaching nuts and washers. Install the fuel filter attaching bolts.
 - c. Carefully remove the caps from the injectors and pressure lines. Connect each pressure line to its respective injector. Connect the excess fuel line to the "T" connection in the cylinder head. Connect the other end of the excess fuel line to the fitting in the forward end of the fuel tank.
14. With an assistant, carefully lift the hood into position on the tractor. Install all of the attaching nuts, bolts and screws. Install the grille. Connect the headlamp wiring.

Select-O-Speed Tractors: Connect the P.T.O. cable to the hood and install the P.T.O. control handle, see Figure 1.

15. Fill the hydraulic system to the proper level. Fill the crankcase to the proper level with the recommended oil. Fill the cooling system with water or the required anti-freeze.
16. Start the engine and check for oil and water leaks.

Gasoline and LP-Gas Engines: Adjust the ignition timing and carburetor as required.

2. ENGINE REMOVAL AND INSTALLATION—SERIES 1801

The removal procedure for the gasoline engine and diesel engine is very similar. Whenever a variation occurs, the procedure for both engines will be explained in the text.

A. Removal

1. Drain the coolant from the radiator, and cylinder block, the oil from the crankcase and the hydraulic oil from the center housing. Disconnect the battery ground cable, the positive (negative on diesel models) battery cable.

NOTE: Do not drain the hydraulic oil from the reservoir.

2. Disconnect the headlamp wire from the bullet type connector located at the rear of the right hood panel and from the connector located in the hydraulic reservoir area at the front of the hood.
3. Remove the six Phillips head screws, nuts, lock washers, flat washers and insulators from the front of the hood. Remove the Phillips head screws from the rear of the hood. Remove the bolts from the underside of the hood panels. Working through the hood opening, remove the nuts and lock washers that attach the hood to the top rear panel. With an assistant, carefully lift the hood from the tractor.
4. Remove the air cleaner tube. Remove the air cleaner attaching bolts and the air cleaner. On diesel engines, remove the air cleaner tube only.

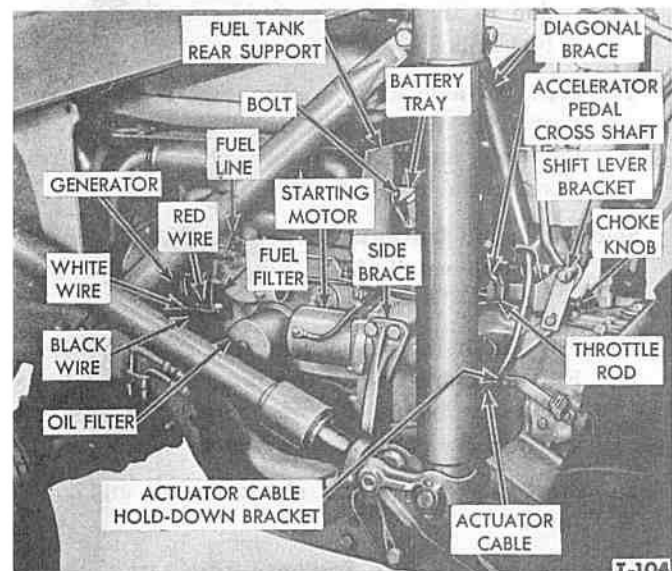


Figure 5—Left Side of Engine

Remove the bolt that attaches the battery tray to the left side of the fuel tank rear support, see Figure 5.

5. Remove the cotter pin and clevis pin that attaches the adjusting link to the power steering pump. Remove the bolt that attaches the pump to the mounting bracket, Figure 6, then lay the pump to one side. Remove the nut and lock washer that attaches the power steering hose retaining bracket to the right front side of the cylinder block.
6. Place a piece of wood over the top of the battery to prevent the fuel tank from accidentally contacting the battery terminals. Loosen the bolt at the right side of the fuel tank support. Remove the bolt and oil pressure gauge retaining clip from the right side of the rear support. Turn the fuel shut-off valve clockwise to close it. Disconnect the fuel line from the filter. Disconnect the fuel gauge wire from the rear of the tank. Remove the two bolts that attach the muffler outlet pipe support bracket to the left side of the fuel tank front support (gasoline engine only). Remove the nut and lock washer that secures the fuel tank front support to the cylinder block. Disconnect the excess fuel line from the forward bottom side of the fuel tank (diesel engine only). Remove the bolt and lock washer from the left side of each fuel tank support. With an assistant carefully lift the fuel tank and supports from the tractor. Remove the wood from the top of the battery.
7. Place a pan under the oil filter, then remove the filter or cartridge. Disconnect the starting motor cable at the starting motor. Remove the three bolts and lock washers that attach the motor to the engine and remove the motor.

Gasoline Engines: Disconnect the throttle rod from the accelerator pedal cross shaft. Disconnect the governor compensating rod spring from the governor lever and remove the assembly. Disconnect the choke rod from the carburetor. Unscrew the knob from the rod. Remove the choke rod.

8. Disconnect the three wires from the generator, see Figure 5.

Gasoline Engines Only: Disconnect the primary wire from the ignition coil, see Figure 6. Lift the wiring harness from the three retaining clips and place it to one side.

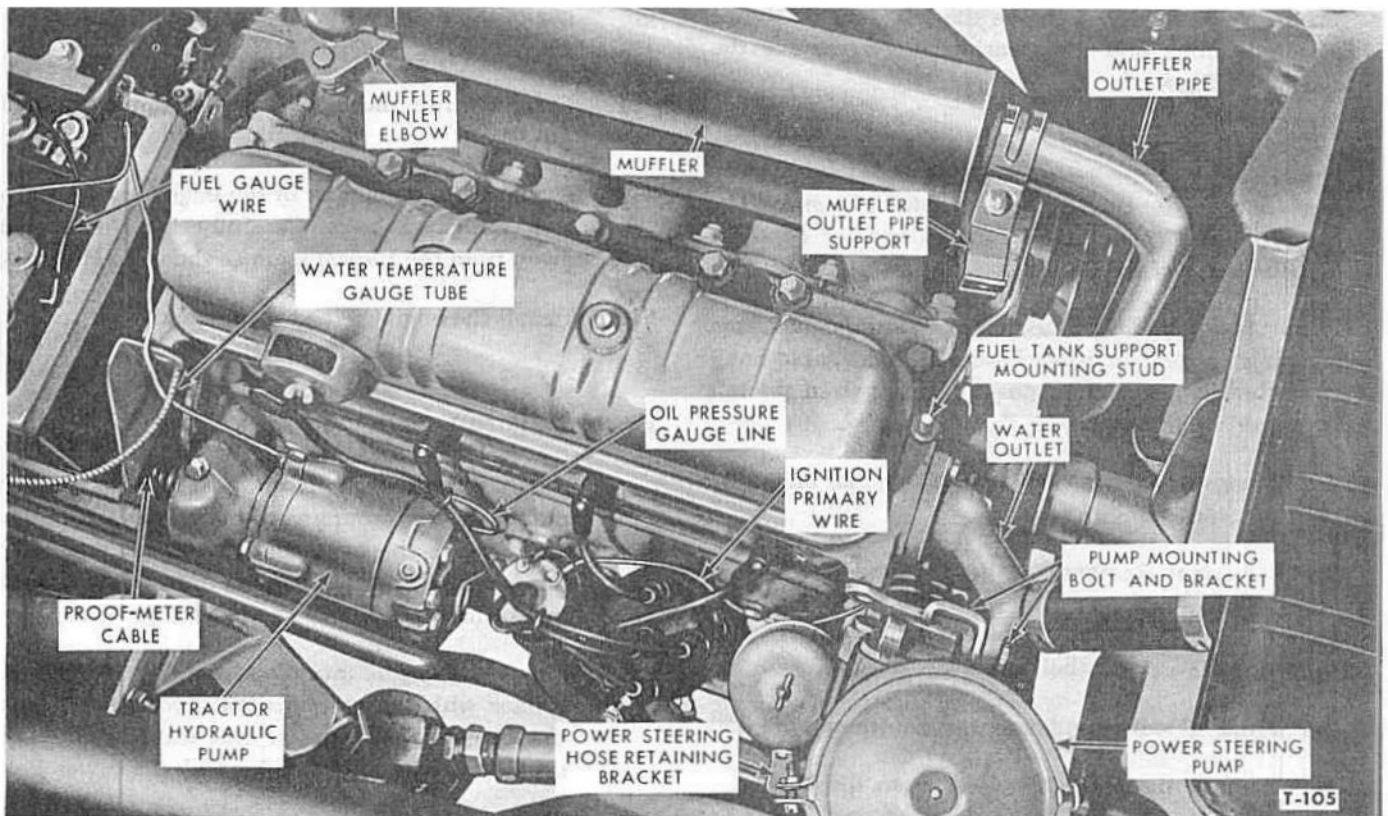


Figure 6—Top View of Engine

9. Disconnect the radiator hoses from the water outlet and from the water pump.
10. Disconnect the water temperature gauge tube from the right side of the cylinder block, see Figure 6.
11. Remove the five right side rail bracket attaching bolts and remove the bracket.
12. Place a drain pan below the hydraulic pump and manifold. Remove the five attaching bolts and washers from the pump and manifold. Carefully pry the hydraulic tubing away from the engine just enough to provide clearance for the hydraulic pump and manifold. Disconnect the oil pressure gauge line from the fitting in the cylinder block.

Tractor With Loader:

- a. Remove the three bolts and lock washers that attach the control valve to the control valve support, see Figure 7. Remove the two bolts and lock washers that attach the control valve support to the cylinder block. Remove the "U" clamp that attaches the support to the filter tube mounting bracket and remove the support.
- b. Remove the two bolts, nuts and lock washers that attach the right diagonal brace to the transmission and the loader frame. Manipulate the brace to free it from the transmission. It is not necessary to remove the brace from the control handles.

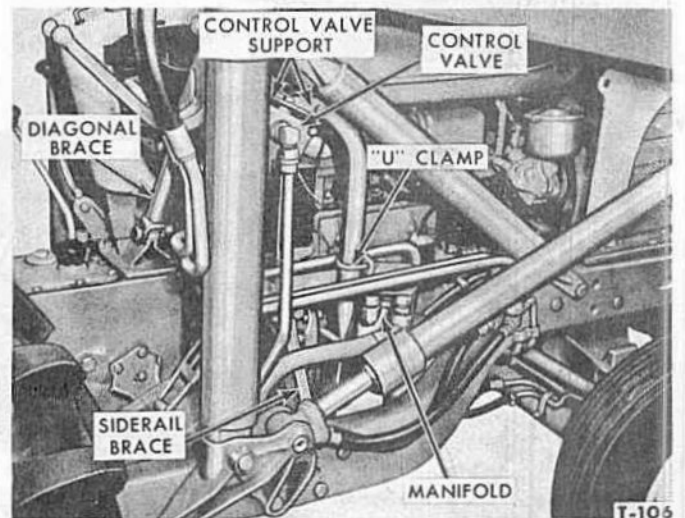


Figure 7—Loader Control Valve and Hydraulic Lines

Tractor With Loader: Remove the left diagonal brace attaching bolts and lock washers, then remove the brace, see Figure 5.

NOTE: *If the tractor is equipped with a reversing transmission, remove the rear bolt and loosen the front bolt of the shift lever bracket. Then swing the bracket outward to provide clearance for removal of the diagonal brace inner bolt.*

Power Steering: Disconnect the actuator cable from the steering gear housing. Disconnect the cable hold-down bracket from the transmission and from the left frame side rail, see Figure 5.

13. Remove the two nuts that attach the engine to the front support.

Diesel Engine: Remove the battery and the battery support to gain access to the top two transmission-to-engine attaching bolts. Disconnect the fuel injection pump linkage at the bellcrank.

14. Place a jack stand under each frame side rail.
15. Remove the two step plates from the tractor.
16. Place a jack under the transmission housing to support the weight. Remove the four fender and side rail attaching bolts. Disconnect the tail lamp wire from the bullet type connector on the left axle housing. Remove the fenders.
17. Install an engine lifting fixture or chain on the

engine. Connect a chain hoist to the engine lifting fixture.

18. Carefully roll the axle rearward approximately 10".
19. Remove the remainder of the engine-to-transmission attaching bolts. Carefully lift the engine away from the transmission as shown in Figure 8.
20. Install the engine in an engine stand.

B. Installation

1. Remove the four bolts and washers that attach the pump drive coupling to the crankshaft pulley and remove the front half of the coupling. Slip the front half of the coupling onto the hydraulic pump shaft.
2. Lower the engine into place and align the clutch splines with the transmission input shaft. Move the engine back against the transmission and install the two upper bolts and the lower bolt.

NOTE: *It may be necessary to rock the engine slightly to enter the input shaft in the clutch.*

3. Carefully roll the rear axle forward while guiding the two engine support studs into the rubber mounts in the support. Install the two engine support nuts and flat washers.
4. Install the fenders. Install the frame side rail braces but do not tighten the attaching bolts. Install the rear fenders and tighten the attaching bolts. Tighten the side brace attaching bolts. Connect the tail lamp wire to the bullet type connector. Secure the wire to the brake cross shaft with the two retaining clips.
5. Align the hydraulic pump coupling hub with the crankshaft and install the four bolts and washers.
6. Install the two step plates.

Power Steering: Connect the power steering actuator hold-down bracket with the two upper left running board attaching bolts at this time.

Diesel Engine: Connect the fuel injection pump linkage to the bellcrank and install the battery tray and battery.

NOTE: *Do not connect the positive battery cable at this time.*

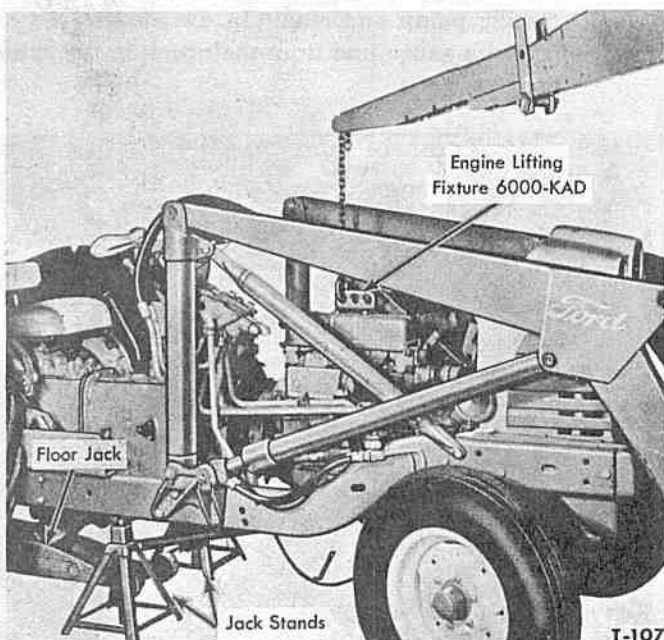


Figure 8—Removing Engine From Tractor

Tractor With Loader: Install the left diagonal brace and secure with two bolts, lock washers and nuts.

Reversing Transmission: Secure the shift lever bracket to the transmission, see Figure 5.

7. Connect the oil pressure gauge line to the fitting in the left side of the cylinder block. Place two new "O" rings on the hydraulic pump manifold mating surface on the transmission and a new gasket on the cylinder block. Position the hydraulic pump and manifold in place and secure with five bolts and washers.

NOTE: *It may be necessary to pry the hydraulic lines away from the engine to provide clearance for the pump and manifold.*

Tractor With Loader:

- a. Secure the right diagonal brace with two bolts, lock washers and nuts.
- b. Secure the control valve support to the lower end of the cylinder block with bolts, lock washers and nuts. Secure the control valve to the support with three bolts and lock washers. Connect the filter tube mounting bracket to the support with the "U" clamp.
8. Place the bushing over the temperature gauge heat bulb and connect the bulb to the cylinder block.
9. Connect the radiator lower hose to the water pump and the upper hose to the water outlet connection.
10. Connect the wiring harness to the generator.

Gasoline Engine: Connect the primary wire to the ignition coil. Place the wiring harness in the three retaining clips on the cylinder block.

11. Working from the front side of the reversing transmission shift lever bracket, insert the threaded end of the choke rod through the bracket and install the knob.

Gasoline Engine: Connect the choke rod to the carburetor.

12. Place a piece of wood over the top of the battery to prevent the fuel tank from accidentally contacting the battery terminals. With an assist-

ant, carefully position the fuel tank and supports in place on the engine. Install and tighten the nut and lock washer that attaches the fuel tank front support to the cylinder block. Install and tighten the four fuel tank support mounting bolts, nuts and lock washers. Make certain that the oil pressure gauge tube retaining clip is in place on the right rear bolt. Connect the fuel line to the filter.

Diesel Engine: Connect the excess fuel line to the bottom forward end of the tank.

Turn the fuel shut-off valve counterclockwise to open the valve. Remove the wood from the battery.

13. Attach the muffler outlet pipe support to the fuel tank support with two bolts and lock washers. Attach the battery support to the fuel tank support with a bolt, lock washer and nut, see Figure 5.

Power Steering: Connect the power steering pump to the mounting bracket with a bolt and lock washer. Connect the belt to the pump and connect the adjusting link with a clevis pin and cotter pin. Adjust the link to obtain $\frac{1}{4}$ " deflection of the belt midway between the pulleys. Attach the power steering hose retaining bracket to the right front side of the cylinder block with a nut and lock washer.

14. Install the air cleaner and air cleaner tube.

NOTE: *If the tractor is equipped with a diesel engine, the air cleaner should be in place making it necessary only to install the tube or the pre-cleaner stack.*

15. Position each hood panel in place on the tractor and install the attaching insulators, bolts, flat washers, lock washers, nuts and screws. Connect the headlamps to the bullet type connector at the front of the hood and at the connector located near the right rear side of the hood.
16. Connect the cable to the battery. Fill the radiator with coolant. Fill the crankcase to the proper level with the recommended oil. Fill the hydraulic system to the proper level with the recommended oil.

17. Start the engine and check for leaks.

Gasoline Engine: Adjust the ignition timing, and carburetor as required.

3. CYLINDER HEAD AND VALVES

The cylinder head assembly consists of the rocker arm mechanism, valves, springs, and valve guides.

The procedures below cover the removal, disassembly, cleaning, inspection, repair and assembly of the cylinder head and valves.

A. Cylinder Head Removal

1. Remove the hood. Drain the coolant from the radiator and cylinder block.
2. Remove the fuel tank and fuel tank support brackets.
3. Disconnect the muffler from the exhaust manifold.

Gasoline Engine: Disconnect the choke rod and accelerator rod from the carburetor.

Gasoline or LP-Gas Engine: Disconnect the fuel line from the fuel filter or carburetor. Disconnect the spark plug wires at the plugs.

CAUTION: Refer to Chapter VI, Section 6 before attempting the removal of an LP-Gas fuel tank.

Diesel Engine: Remove the air cleaner tube. Disconnect the manifold heater wires at the manifold heaters.

4. Remove the nuts and washers that attach the intake and exhaust manifold to the cylinder block. Remove the manifold.

NOTE: On diesel engines, the intake manifold is separate from the exhaust manifold.

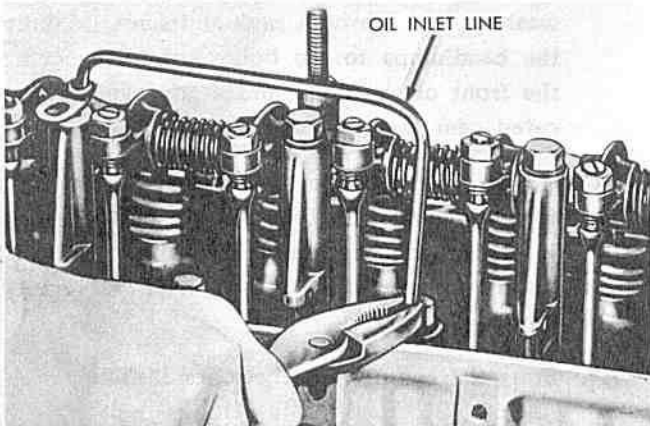


Figure 9—Removing Rocker Arm Oil Inlet Line

5. Disconnect the water temperature gauge from the cylinder head. Remove the radiator upper hose.
6. Disconnect the adjusting link from the power steering pump. Remove the bolts that attach the pump to the cylinder head and the water outlet elbow.
7. Remove the rocker arm cover and gasket.
8. Loosen the rocker arm support attaching bolts evenly and alternately until all tension has been relieved then remove the bolts and washers.
9. Remove the rocker arm oil inlet line from the cylinder block as shown in Figure 9. Lift the oil inlet and outlet lines from the rocker arm supports. Lift the rocker arm assembly from the cylinder head. Lift the push rods out of the cylinder head, and place in a numbered rack so that they may be reinstalled in their respective position.

Diesel Engines:

- a. Disconnect the excess fuel line at the tee connection, Figure 10. Remove the four bolts that attach the excess fuel line to the injectors and remove the line.
 - b. Remove all dirt from the fuel injector pressure line connections. Disconnect the pressure line at each injector. Cap off the exposed ends of the injectors and the lines to prevent the entry of dirt.
 - c. Remove the two attaching bolts from each injector. Attach Injector Lifting Bar, EIADDN-17098 to the injectors as shown in Figure 11. Make sure the legs of the tool bear against the cylinder head rather than the rubber injector seal. Remove the fuel injectors and the injector seat washers from the cylinder head.
 - d. Remove the two bolts and lockwashers that attach the fuel filter to the cylinder head.
10. Remove the bolts that attach the cylinder head to cylinder block. Carefully lift the cylinder head from the block.

NOTE: If available, use Cylinder Head Overhaul Fixtures, 6085-F.

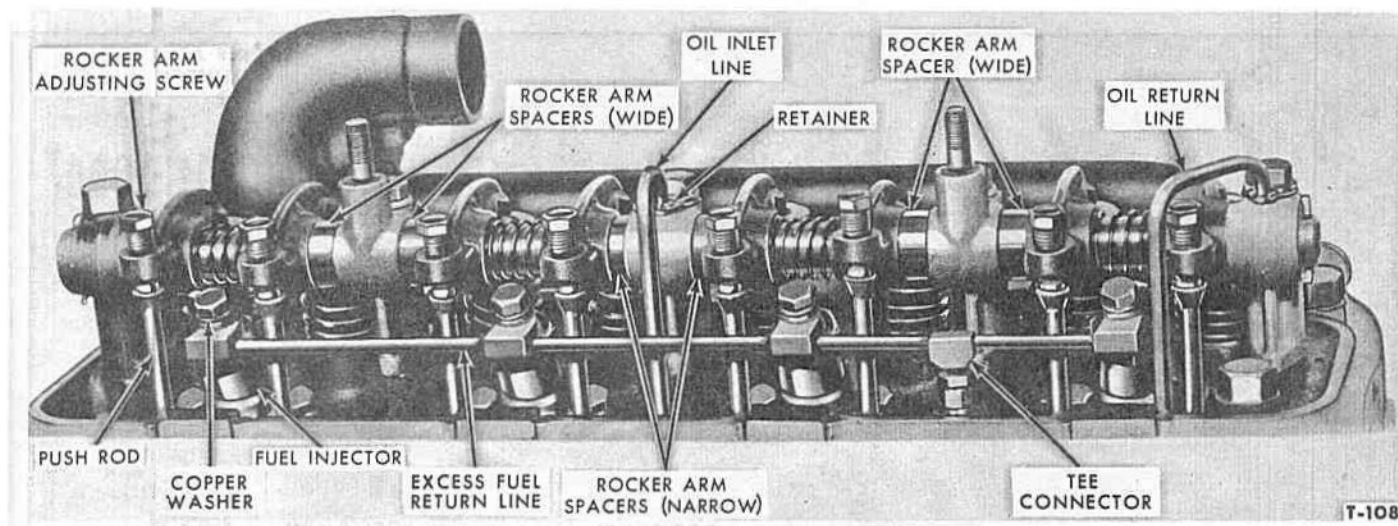


Figure 10—Diesel Engine With Rocker Arm Cover Removed

B. Cylinder Head Disassembly

1. Remove the two bolts and lockwashers that attach the water outlet elbow to the cylinder head. Remove the elbow and thermostat.
2. Prior to removing the valves, clean all carbon deposits from the combustion chambers. Position Valve Spring Compressor 6513-EE over the valve and spring as shown in Figure 12 and compress the valve spring. Remove the two valve spring retainer locks, sleeve, retainer, spring and

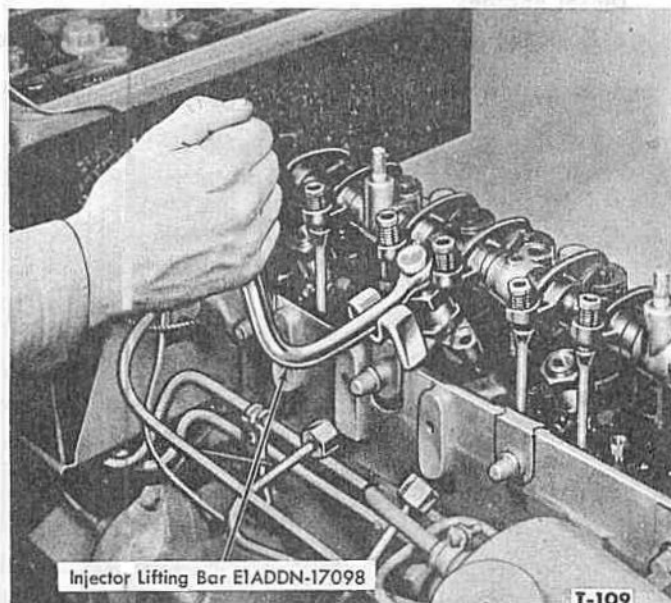


Figure 11—Removing Fuel Injectors

spacer from each valve. Lift the valves from the head and place them in a numbered rack so that they can be installed in their respective guides.

NOTE: Exhaust valves are provided with a cap and do not have a sleeve. Spacers are used originally only under the exhaust valve springs on diesel engines.

3. Remove the cotter pin, flat washers and spring washer from each end of the rocker shaft, Figure 13.

NOTE: Diesel engines do not have the flat washers and spring washer.

Remove the rocker arms and rocker arm locat-

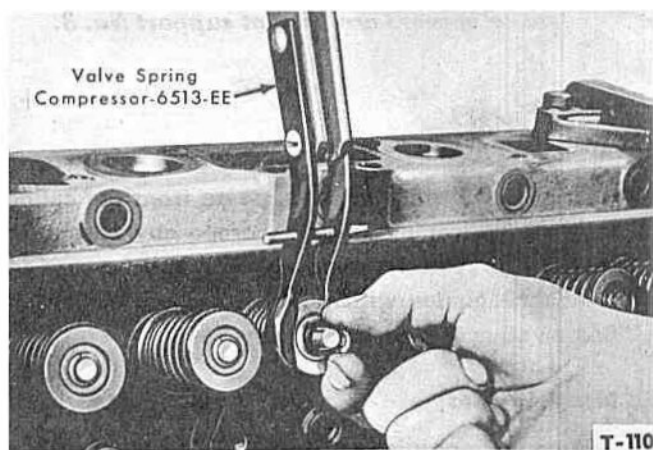


Figure 12—Removing Valve Spring Retainer Locks