Service Manual

B SERIES

C SERIES

D SERIES

VOL. 1

WHEEL HORSE lawn & garden tractors

PRICE: $5.00

PART NO. 810063R1
PRINTED IN U.S.A. 0778

FOREWORD

This publication has been prepared to assist Wheel Horse dealers in servicing B and C-Series, D-160 and D-200 tractors. Information for the C-161 Twin 8-Speed or Automatic, is given separately at the end of each chapter.

Information contained in this manual is concentrated on areas that require adjustment, as well as removal, replacement, and overhaul of some of the more complex systems of the tractors. Repair of major assemblies, such as mechanical and automatic transmissions, and the Onan engine, is detailed in other Wheel Horse Service Manuals. Repair of Briggs and Stratton or Kohler engines, and the Peerless transaxle, is described in literature available from their respective manufacturers.

Knowledge of basic mechanical and electrical repair work is essential when using this publication. Always observe common shop safety rules while performing service work.

Replace all parts that are worn or no longer serviceable. Always replace expendable parts, such as O-rings, gaskets, and seals.

Section 1 lists specifications, torque values, and special instructions not listed in the general text. It is advised that you become familiar with this information before making adjustments or repairs.

THIS MANUAL APPLIES TO THE FOLLOWING VEHICLES:

MODEL	VEHICLE IDENTIFICATION NUMBER
B-81 4-Speed	82-08BP01, 92-08BP01
B-111 4-Speed	82-11BP01, 92-11BP01
C-81 8-Speed	81-08K801, 91-08K801
C-101 8-Speed	81-10K801, 91-10K801
C-121 8-Speed	81-12K801, 91-12K801
C-121 Automatic	81-12KS01
C-141 8-Speed	81-14K801, 91-14K801
C-141 Automatic	81-14KS01
C-161 8-Speed	81-16K801
C-161 Automatic	81-16KS01
C-161 Twin 8-Speed	81-16B801, 91-16B801
C-161 Twin Automatic	81-16BS01, 91-16BS01
D-160 Automatic	81-16OS01
D-200 Automatic	81-20KS01, 91-20KS01

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SPECIFICATIONS

TRACTOR SPECIFICATIONS:

ENGINE:

TRACTOR MODEL	ENGINE MODEL*	ENGINE SPEC. NO.	RATED H.P.**	DISPLACEMENT cu. in./cc	BORE in./mm	STROKE in./mm	IGNITION
B-81	B-191707	1136-01	8	19.44/318.56	3/76.2	2.75/69.9	Magneto
B-111	B-252707	0151-01	11	24.36/399.19	3.438/87.3	2.625/66.7	Magneto
C-81	K181S	PF30700D	8	18.6/304.8	2.94/74.7	2.75/69.8	Battery
C-101	K241AS	PF46766D	10	23.9/391.6	3.25/82.6	2.88/72.9	Battery
C-121	K301AS	PF47648D	12	29.07/476.4	3.38/85.7	3.25/82.6	Battery
C-141	K321AS	PF60322D	14	31.27/512.4	3.5/88.9	3.25/82.6	Battery
C-161	K341AS	PF71246A	16	35.89/588.1	3.75/95.3	3.25/82.6	Battery
C-161 Twin	B-401407	0130-01	16	40/655.7	3.438/87.3	2.156/54.8	Magneto
D-160	O-BF	MS3268F	16	40.3/660.4	3.125/79.4	2.625/66.7	Battery
D-200	K532S	53105A	19.9	53.68/879.7	3.38/85.7	3/76.2	Battery

*Letter Prefix: B = Briggs & Stratton, K = Kohler, O = Onan. Basic engine model number shown; specification and serial numbers from engine I. D. plate are required to completely identify engine.

**Engine manufacturer's rating at 3600 RPM.

TRANSMISSION:

B-Series Models		C-Series 8-Speed Models
Type:	Mechanical All Gear	Mechanical All Gear
Number of Forward Speeds:	3	6
Number of Reverse Speeds:	1	2
Approximate Ground Speeds (at full throttle):	Gear Speed 1st 1.7 mph (2.7 kph) 2nd 3.6 mph (5.8 kph) 3rd 5.5 mph (8.8 kph) Rev. 2.5 mph (4 kph)	Gear Low Range High Range 1st .5 mph (.8 kph) 2 mph (3.2 kph) 2nd .8 mph (1.3 kph) 3.2 mph (5.2 kph) 3rd 1.4 mph (2.2 kph) 5.5 mph (8.8 kph) Rev. .6 mph (1 kph) 2.6 mph (4.2 kph)
C-Series Automatic Models		**D-Series Automatic Models**
Type:	Hydrostatic	Hydrostatic
Number of Forward Speeds:	Infinite	Infinite
Number of Reverse Speeds:	Infinite	Infinite
Approximate Ground Speeds (at full throttle):	Variable 0-6.3 mph (10 kph) Forward Variable 0-3.2 mph (5.2 kph) Reverse	Variable 0-7.5 mph (12 kph) Forward Variable 0-3.6 mph (5.8 kph) Reverse

ELECTRICAL SYSTEM:

Type:	12 Volt D.C., Negative Ground
Alternator:	Briggs & Stratton — Dual Circuit, 12 Volt, 3 Amp. (Charging Circuit) Onan and Kohler — 12 Volt, 15 Amp.
Battery:	B-81, B-111, C-81 — 12 Volt, 24 Amp. Hr. C-101, C-121, C-141, C-161 — 12 Volt, 32 Amp. Hr. D-160, D-200 — 12 Volt, 45 Amp. Hr.

TIRES:

Sizes:	Front	Rear
B-81	13 x 5:00-6	18 x 8:50-8
B-111	13 x 6:50-6	18 x 9:50-8
C-Series	16 x 6:50-8	23 x 8:50-12
D-Series	18 x 8:50-8	26 x 12:00-12
Pressure:		
PSI	12	12
kg/cm²	.85	.85

TRACTOR SPECIFICATIONS (continued):

PHYSICAL DATA:

TRACTOR MODEL	HEIGHT	LENGTH	WIDTH	WHEEL BASE	OUTSIDE TURNING RADIUS	DRY WEIGHT
B-81	37 in. (94 cm)	65 in. (165 cm)	34.5 in. (88 cm)	45.5 in. (116 cm)	80 in. (203 cm)	400 lbs. (180 kg)
B-111	37 in. (94 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	80 in. (203 cm)	405 lbs. (182 kg)
C-81	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	540 lbs. (243 kg)
C-101	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	590 lbs. (266 kg)
C-121 8-Speed	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	600 lbs. (270 kg)
C-121 Automatic	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	630 lbs. (284 kg)
C-141, C-161 8-Speed	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	600 lbs. (270 kg)
C-161 Twin 8-Speed	41 in. (104 cm)	69 in. (175.3 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	550 lbs. (249 kg)
C-141, C-161 Automatic	41 in. (104 cm)	65 in. (165 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	640 lbs. (288 kg)
C-161 Twin Automatic	41 in. (104 cm)	69 in. (175.3 cm)	36 in. (92 cm)	45.5 in. (116 cm)	75.75 in. (192 cm)	590 lbs. (266 kg)
D-160	45.5 in. (116 cm)	75.5 in. (192 cm)	45 in. (114 cm)	50 in. (127 cm)	90 in. (229 cm)	875 lbs. (394 kg)
D-200	45.5 in. (116 cm)	75.5 in. (192 cm)	45 in. (114 cm)	50 in. (127 cm)	90 in. (229 cm)	1025 lbs. (461 kg)

TUNE-UP/GENERAL MAINTENANCE SPECIFICATIONS:

ENGINE:

TRACTOR MODEL	POINT GAP in./mm	TIMING MARK LOCATION	IGNITION TIMING (BTDC)	SPARK PLUG TYPE*	SPARK PLUG GAP in./mm	DIRECTION OF ROTATION (Facing PTO)	IDLE RPM (No Load)	GOVERNED MAX. RPM (No Load)
B-81	.020/.5	N/A	Fixed	CJ-8	.030/.76	Counterclockwise	1750	3300
B-111	.020/.5	N/A	Fixed	CJ-8	.030/.76	Counterclockwise	1750	3300
C-81	.020/.5	N/A	Fixed	J-8	.025/.64	Counterclockwise	1900	3500
C-101	.020/.5	N/A	Fixed	H-10	.025/.64	Counterclockwise	2100	3400
C-121	.020/.5	N/A	Fixed	H-10	.025/.64	Counterclockwise	2100	3400
C-141	.020/.5	N/A	Fixed	H-10	.025/.64	Counterclockwise	2100	3400
C-161	.020/.5	N/A	Fixed	H-10	.025/.64	Counterclockwise	2100	3400
C-161 Twin	.020/.5	N/A	Fixed	J-8	.030/.8	Counterclockwise	1450	3300
D-160	.023/.6	Flywheel	25° (Cold)	H-8	.025/.64	Counterclockwise	1350	3600
D-200	.020/.5	Flywheel	27°	H-10	.035/.9	Counterclockwise	1350	3600

*Or equivalent (Champion number shown).

TUNE-UP/GENERAL MAINTENANCE SPECIFICATIONS (continued):

LIQUID CAPACITIES:

Crankcase:

B-81 — 1⅛ qt. (1.1 *l*)
B-111 — 1½ qt. (1.4 *l*)
C-81 — 1¼ qt. (1.2 *l*)
C-101 — 1½ qt. (1.4 *l*)
C-121 — 1½ qt. (1.4 *l*)
C-141 — 1½ qt. (1.4 *l*)
C-161 — 1½ qt. (1.4 *l*)
C-161 Twin — 1¾ qt. (1.7 *l*)
D-160 — 2¼ qt. (2.1 *l*) w/filter
D-200 — 3½ qt. (3.3 *l*) w/filter

Transmission:

B-Series — ¾ qt. (.7 *l*) SAE 90, API Service GL5
C-Series 8-Speed — 2 qt. (1.9 *l*) SAE 140, API Service GL5
C-Series Automatic — 5.5 qt. (5.2 *l*) SAE 10W-30 or 10W-40
D-Series — 6 qt. (5.7 *l*) SAE 10W-30 or 10W-40

Fuel Tank:

B-Series — 1½ gal. (5.7 *l*)
C-Series — 3 gal. (11.4 *l*)
D-160 — 5¾ gal. (21.9 *l*)
D-200 — 8 gal. (30.4 *l*)

ENGINE OIL: TEMPERATURE – VISCOSITY CHART

Air Temperature	Oil Viscosity
Briggs and Stratton Engine	
Above 40°F (4°C)	SAE 30*, 10W-30, 10W-40
40° to 0°F (4° to -18°C)	SAE 5W-20 or 5W-30*, 10W, 10W-30
Below 0°F (-18°C)	SAE 10W or 10W-30, Diluted 10% with kerosene
API Service: "SC" (MM), "SD" (MS) or "SE" oil	
Kohler Engine	
Above 30°F (-1°C)	SAE 30*, 10W-30, 10W-40
30° to 0°F (-1° to -18°C)	SAE 10*, 5W-30, 10W-30, 10W-40
Below 0°F (-18°C)	SAE 5W-20, or 5W-30
API Service: "SC" (MM), "SD" (MS) or "SE" oil	
Onan Engine	
Above 30°F (-1°C)	SAE 30
Below 30°F (-1°C)	SAE 5W-30
API Service: "SE" oil	

* Preferred viscosity. Use alternates listed if preferred viscosity is unavailable.

CHASSIS:

Zerk Fittings:

B-Series – 6
C-Series – 6
D-Series – 7

PTO Brake Adjustment (PTO engaged):

B-Series – .010 (.25 mm) Gap between brake pad and pulley

C-Series – .012 (.3 mm) Gap between brake pad and pulley

D-200 – .012 (.3 mm) Gap between brake pad and pulley

D-160 – .010/.015 (.25 - .4 mm) Gap between rotor and armature

Front Wheel End Play:
All Models 0 to .015 in. (.4 mm)

Front Wheel Alignment (toe-in):
D-Series only – 1/16 - 1/8 in. (1.6 - 3.2 mm)

TORQUE VALUES:

SPECIAL

Tractor Model	Location	Torque ft-lb	Torque Nm
C-Series	Rear wheel hub set screws	28 - 32	39 - 45
	Fuel tank front bolt	5 - 8	7 - 11.2
	Fuel tank insert bolt	5 - 8	7 - 11.2
D-Series	Fuel tank nuts	12	17

GENERAL

Size	Torque ft-lb	Torque Nm
1/4 - 20	8	11
5/16 - 18	17 - 22	24 - 31
3/8 - 16	30 - 35	42 - 49
3/8 - 24	25 - 30	35 - 42
1/2 - 13	75 - 80	105 - 112
Self Tapping Screws - All Models		
5/16 - 18	15	21
3/8 - 16	25	35

SPECIAL INSTRUCTIONS

All Models

- Lube all grease fittings with No. 2 General Purpose lithium grease
- Coat exposed areas of axle hubs with anti-rust lubricant (Texaco Compound "L," Light, Code 1976 or equivalent)
- Install seat spring long leg toward seat.

C-Series Models

- Adjust lift chain so length from bolt through lower link to trunnion center is 7.4 inches (19 cm). For final adjustment, see Section 7
- Kohler engines: assemble engine PTO pulley 1/16 inch (1.6 mm) from engine face
- Adjust PTO brake to provide .012" (.3 mm) clearance between brake pad and pulley when clutch is engaged
- Coat lift lever shaft with anti-rust lubricant (Texaco Compound "L," Light, Code 1976 or equivalent)
- Use Isomount No. 106434, color code white, for all models except C-81. Use Isomount No. 106441, no color code, for C-81 models
- Fuel hose must remain clear of Sundstrand Transmission. Secure hose to top of transaxle and bottom of hoodstand.

D-Series Models

- Fasten rectifier wire to inside edge of frame with wire clip
- Align front wheels for 1/16 to 1/8 inch (1.6 to 3.2 mm) toe-in
- Steering gear to contain 1/4 lb.(0.1 kg) grease
- Adjust choke and throttle friction to provide 8 to 10 lb. (1.8 to 2.3N) pull force at knobs
- Adjust friction on control cam to provide 16 to 20 lb. (3.6 to 4.5N) pull force at top of motion control lever
- Tie wrap wiring harness to steering column
- Grease input shaft spline of hydro pump and brake rod (approximately 2 inches past threaded end) with "moly" grease.
- Locate bottom edge of muffler 1 3/4 inch (4.4 cm) above grille shroud assembly
- Adjust brake rods so brake band just clears drum with pedal released
- Adjust park brake rod with brake handle in engaged position
- Install spring disc washers on choke and throttle controls as shown in Fig. 1-1.

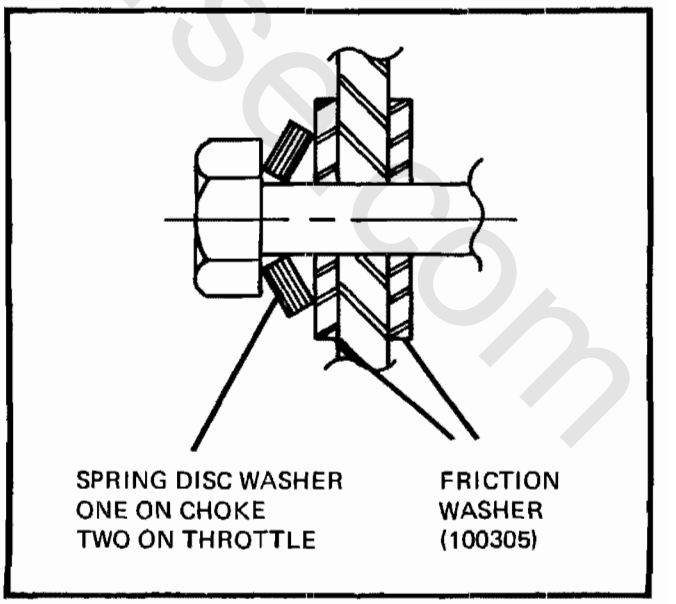


Fig. 1-1 Control Friction

– PTO Brake Adjustment:
  a. D-160 – adjust PTO brake for .010/.015 inch (.25 to .4 mm) gap between rotor and armature assembly
  b. D-200 – adjust PTO brake for .012 inch (.3 mm) gap between brake pad and pulley with PTO engaged
– Flex Coupling
  a. D-160 – install engine/pump flex coupling parts as shown in Fig. 1-2

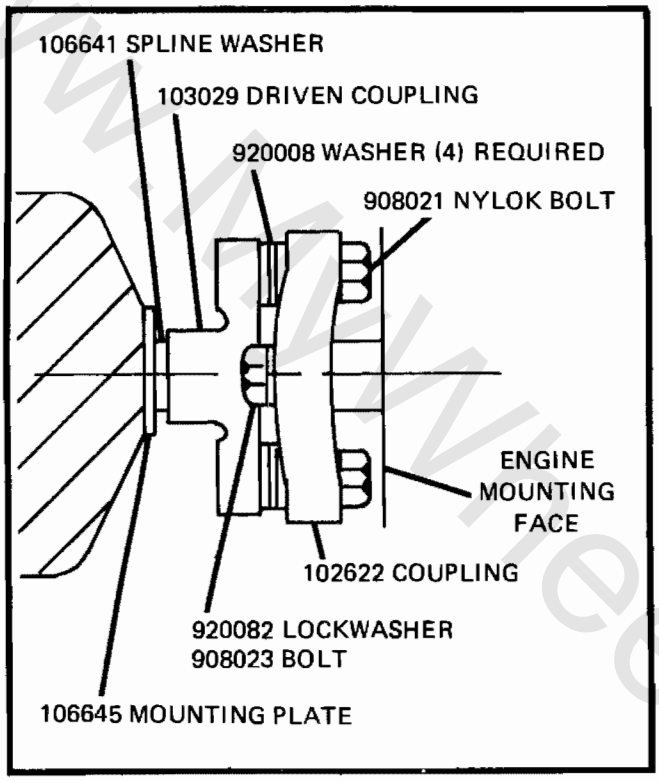


Fig. 1-2 D-160 Flex Coupling

b. D-200 – install engine/pump flex coupling parts as shown in Fig. 1-3

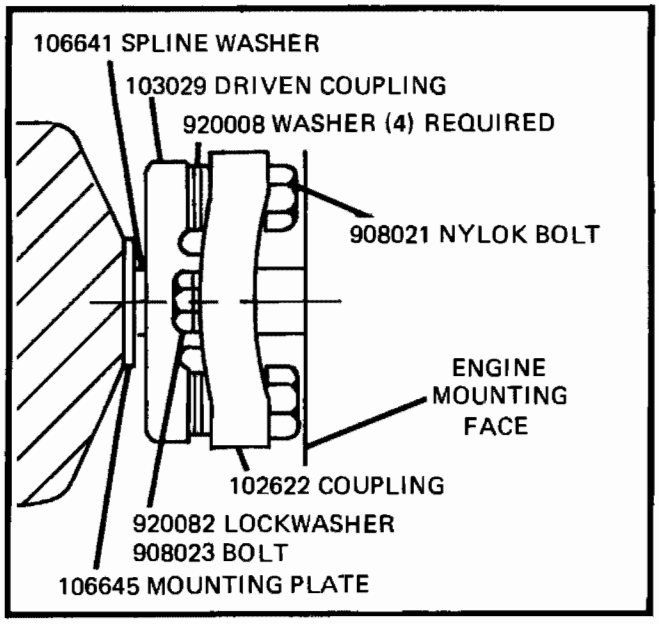


Fig. 1-3 D-200 Flex Coupling

– D-200 – cable tie headlight wire and ignition wire to the governor vacuum hose

– D-200 PTO – adjust PTO clutch hook to 1 13/16 inch (4.6 cm) from engine face to hook centerline. Adjust clutch turnbuckle for 16 to 18 lb. (3.6 to 4.0 N) pull on clutch handle, and complete disengagement of clutch pulley

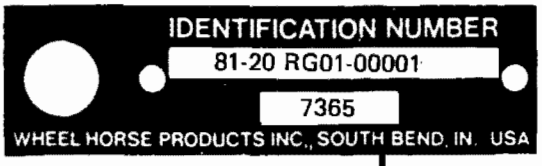
– D-200 – grease chrome bearing surface of PTO clutch plate with "moly" grease.

C-161 TWIN

TORQUE VALUES:
Same as C-Series

SPECIAL INSTRUCTIONS:
Same as C-Series except:

– **Drive pulley set screw to be tightened while PTO is engaged to pre-load thrust bearing.**



81-20 RG 01-00001

JULIAN DATE
- year and day manufactured
- 7 365

DAY
365th day of year

YEAR
7 = 1977
8 = 1978

SERIAL NUMBER
00001 through 99999

PARTS LIST CODE
01 through 99

MODEL YEAR
6 = 1976
7 = 1977
8 = 1978
9 = 1979
0 = 1980
1 = 1981
2 = 1982
3 = 1983
4 = 1984

PRODUCT CATEGORY
1 = GARDEN TRACTORS
2 = LAWN TRACTORS
3 = RIDERS
4 = SNOW THROWERS – WALK-BEHIND
5 = ROTARY MOWER ATTACHMENTS
6 = SNOW REMOVAL ATTACHMENTS
7 = TILLAGE AND YARD ATTACHMENTS
8 = NOT ASSIGNED
9 = NOT ASSIGNED
0 = NOT ASSIGNED

***** **BASIC PRODUCT INFORMATION FOR: PRODUCT CATEGORIES 1, 2, 3, 4**

ENGINE MAKE CODE
B = BRIGGS & STRATTON
K = KOHLER
O = ONAN
R = RENAULT
T = TECUMSEH
E = BATTERY POWER

TRANSMISSION MAKE CODE
E = EATON
F = FOOTE
G = GUTBROD
P = PEERLESS
S = SUNDSTRAND
4 = 4-SPEED WHEEL HORSE
8 = 8-SPEED WHEEL HORSE

PRODUCT CATEGORY 5
MS = MID MOUNT, SIDE DISCHARGE
MR = MID MOUNT, REAR DISCHARGE
RS = REAR MOUNT, SIDE DISCHARGE
RR = REAR MOUNT, REAR DISCHARGE
FS = FRONT MOUNT, SIDE DISCHARGE
FR = FRONT MOUNT, REAR DISCHARGE

PRODUCT CATEGORY 6
ST = SNOW THROWER
BA = SNOW BLADE
BC = SNOW BLADE
BN = SNOW BLADE

PRODUCT CATEGORY 7
BM = BLADE, MID MOUNT
TE = TILLER (BATTERY)
TL = TILLER
PL = MOLDBOARD PLOW
PR = PLOW, REVERSIBLE
DS = DISC
HR = HARROW
PT = PLANTER
CM = CULTIVATOR, MID MOUNT
CR = CULTIVATOR, REAR MOUNT
WG = WAGON, 4-WHEEL
DC = DUMP CART
RL = ROLLER
AR = AERATOR
SW = SWEEPER
VC = LAWN VACUUM

EFFECTIVE CATEGORY MEASUREMENT IE – HORSEPOWER, WIDTH OR CAPACITY FOR:

PRODUCT CATEGORIES 1, 2, 3, 4
05 = 5 H.P.
08 = 8 H.P.
10 = 10 H.P.
11 = 11 H.P.
12 = 12 H.P.
14 = 14 H.P.
16 = 16 H.P.
20 = 20 H.P.

PRODUCT CATEGORY 5
26 = 26" CUT WIDTH
30 = 30" CUT WIDTH
32 = 32" CUT WIDTH
36 = 36" CUT WIDTH
42 = 42" CUT WIDTH
48 = 48" CUT WIDTH
60 = 60" CUT WIDTH

PRODUCT CATEGORY 6
42 = 42" WIDTH
48 = 48" WIDTH
56 = 56" WIDTH
59 = 59" WIDTH

PRODUCT CATEGORY 7
08 = 8" FURROW WIDTH
12 = 12" FURROW WIDTH
05 = 5 CU. FT. CAPACITY
10 = 10 CU. FT. CAPACITY
18 = 18 CU. FT. CAPACITY
31 = 31" WIDTH
38 = 38" WIDTH
40 = 40" WIDTH
42 = 42" WIDTH
44 = 44" WIDTH
50 = 50" WIDTH
59 = 59" WIDTH
ETC.

* *IN CERTAIN CASES, THIS MAY BE CODED WITH AN "X", "Y", OR "Z" IN EITHER POSITION. THIS IS TO AVOID DUPLICATION OF V.I.N. NUMBERS WHERE BASIC PRODUCT INFORMATION IS IDENTICAL. EXAMPLE: 85-36MR01 AND 85-36XR01.*

PRE-DELIVERY SERVICE

B-SERIES, C-SERIES, and D-SERIES Automatic Tractors

Install Front Wheel and Tire Assemblies

Using a suitable hoist or jack, raise the front of the tractor.

A. If a floor jack is used, center the jack under the frame assembly behind the front axle. Use a 2" x 4" piece of lumber or similar material, long enough to span the width of the frame, between the jack and the tractor to prevent damage to the vehicle.

B. If a chain hoist is used, attach the hoist to the front axle, being careful not to scratch the side of the engine, hood, or the axle itself. On C and D-Series tractors, an alternate hoisting point can be made by installing a piece of rod stock (5/8" on C-Series; 3/4" on D-Series) in the front Tach-a-matic hitch. Be careful not to scratch the grille.

Install a wheel and tire assembly on each spindle as illustrated in Fig. 2-1, 2-2, or 2-3, as appropriate. The tire valve stem should be to the outside on B-Series vehicles and to the inside on C and D-Series vehicles. Correct wheel end play is 0 to .015 inch (.4 mm). In some cases it may be necessary to add or remove a shim washer to achieve correct end play.

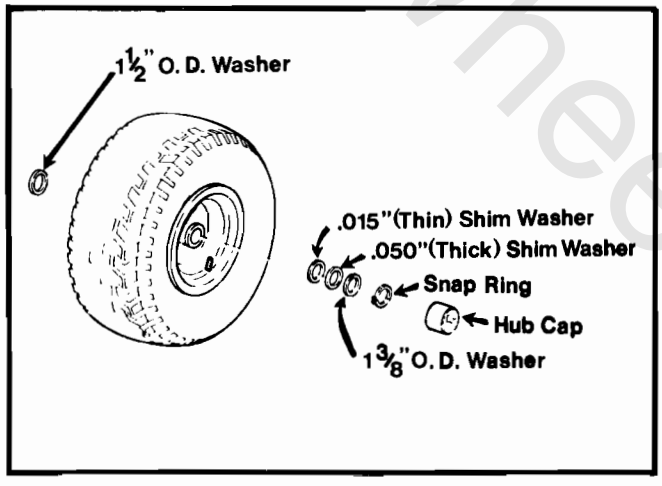


Fig. 2-1 B-Series Front Wheel Installation

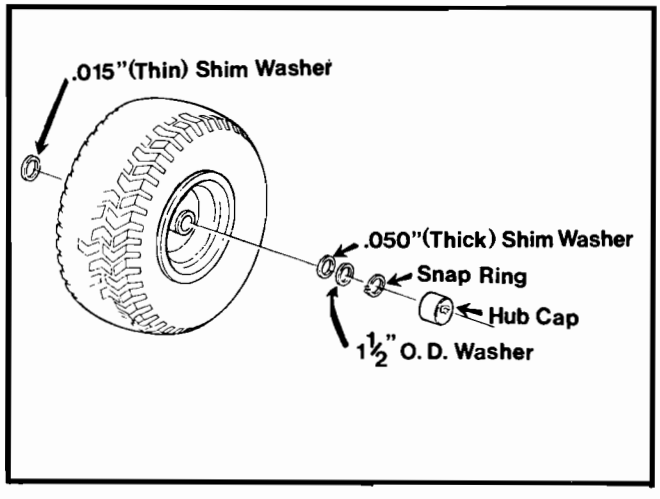


Fig. 2-2 C-Series Front Wheel Installation

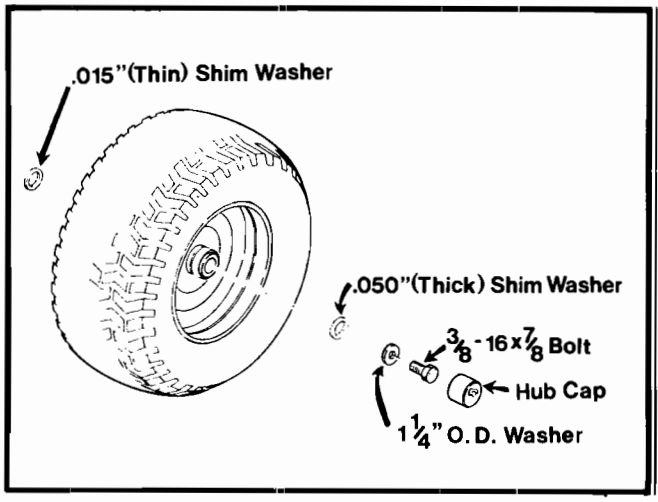


Fig. 2-3 D-Series Front Wheel Installation

Install Footrest (D-Series Only)

Raise the rear of the tractor (see Install Rear Wheel and Tire Assemblies). Install the footrests as shown in Fig. 2-4. Note that the bolt holding the rear of the mid lift bearing must be removed to install the footrest and is replaced after the footrest is installed. The "L" shaped bracket is installed at the front of each footrest as shown in Fig. 2-4.

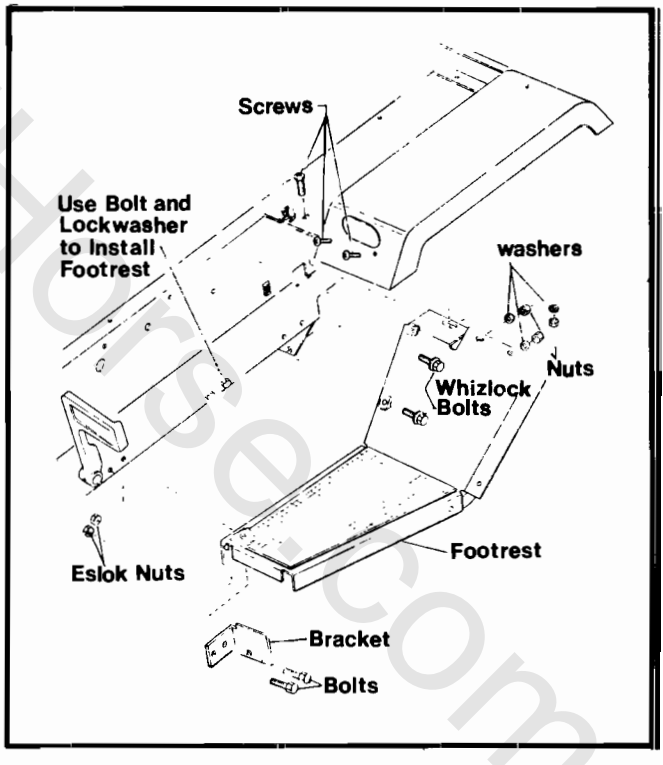


Fig. 2-4 D-Series Footrest Installation

Install Rear Wheel and Tire Assemblies

Raise the rear of the tractor.

A. If a floor jack is used, center the jack under the transmission case. Use a 2" x 4" block of wood or similar material, between the jack and the transmission to prevent damage to the transmission case.

B. If a chain hoist is used, attach the hoist to the drawbar hitch on C and D-Series tractors and to the rear axle on B-Series tractors.

B-SERIES

Apply a coating of rust preventative on the axle shafts (Texaco Compound "L," Light, Code 1976, or equivalent). Mount a rear wheel and tire on each axle shaft as shown in Fig. 2-5, with the tire valve stem to the outside. Use the shim washers as required for minimum end play. Lower the tractor, and remove the jack or hoist.

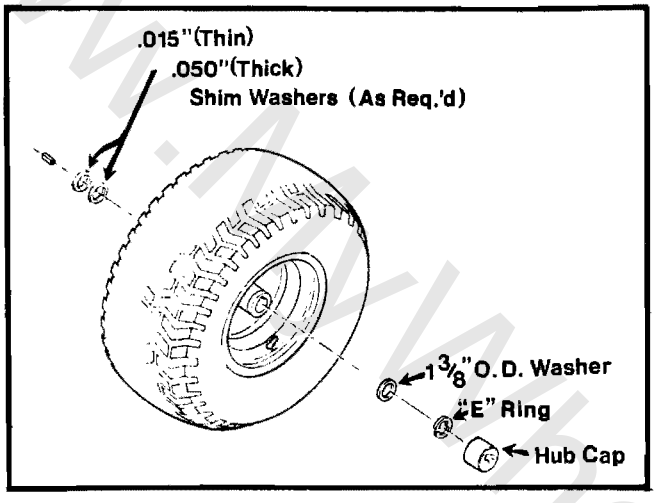


Fig. 2-5 B-Series Rear Wheel Installation

C AND D-SERIES

Mount a rear wheel and tire assembly on each axle hub so the tire valve stem faces inside on the C-Series and outside on the D-Series. Secure each wheel and tire assembly with the lug bolts provided. On C-Series tractors, starting at the top, tighten every other lug bolt until all are tight. On D-Series tractors, alternately tighten lug bolts on opposite sides of the wheel until all are tight. Torque the lug bolts to 75 to 80 ft. lbs. (105 to 112 Nm).

Lower the tractor and remove the jack or hoist.

Adjust Tire Pressure

Using a low pressure tire gauge, adjust the tire pressure in all four tires:

	Front	Rear
PSI	12	12
kg/cm^2	.85	.85

Mount Steering Wheel

B AND C-SERIES

Install the bowed spring washer and plastic spacer over the steering shaft. With the wheels straight ahead, install steering wheel so that the spokes form a "Y" and line up the hole in the wheel hub with the hole in the steering shaft.

Insert a 1/4 punch through the hole to hold the steering wheel in position. Install the 1/4 x 2 spirol pin by driving it in with a hammer; as the spirol pin is driven in, it should push the punch out.

D-SERIES

With the front wheels straight ahead, place the steering wheel on the steering shaft so that the spokes form a "Y". Secure the wheel with a 5/8-18 jam nut. Snap the steering wheel insert into place so the "R", inside the wheel, is straight when viewed from the driver's seat.

Service the Battery

⚠ CAUTION ⚠

Electrolyte and battery fluid are poisonous and can be injurious to eyes, skin, and clothing. In the event of an accident, flush immediately with a solution of one part baking soda to four parts water. Notify physician immediately. If baking soda is not immediately available, flush affected area with water. Notify physician immediately.

1. Remove the battery from the tractor. Never fill battery with electrolyte with battery installed in tractor.
2. Use an electrolyte with a specific gravity of 1.260; fill each cell until the electrolyte (battery acid) is 1/4 to 1/2 inch (6 to 13 mm) over the top of the separators. DO NOT OVERFILL.
3. Place the filled dry charged battery on charge before installing. Charge at 15 amperes for 30 minutes. After charging, top off each cell with electrolyte.

After battery has been in service, add only low mineral content water. DO NOT ADD ELECTROLYTE (battery acid).

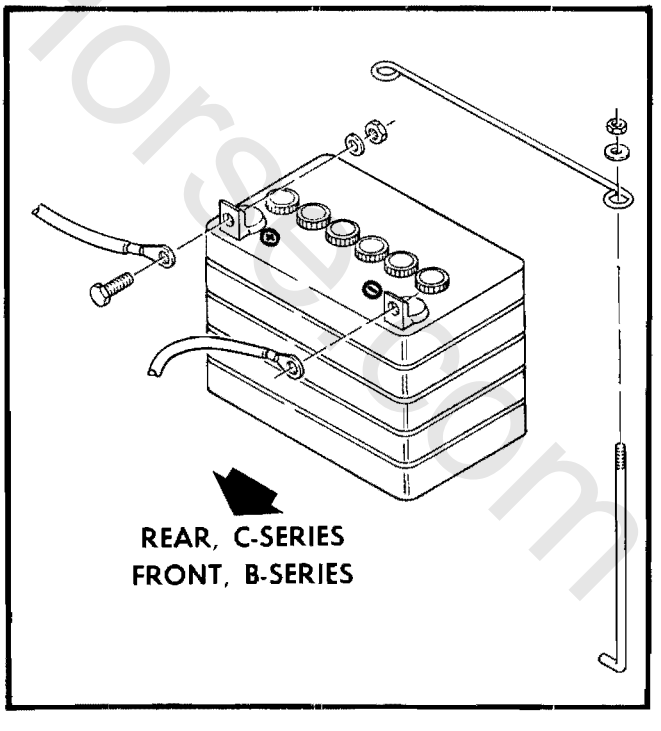


Fig. 2-6 B and C-Series Battery Installation

4. Install battery in the tractor, making sure the terminal posts are positioned properly. Install the battery hold down assembly. Tighten the nuts only enough to keep the battery from moving. DO NOT OVER-TIGHTEN.
5. Reinstall the battery cables as shown in Fig. 2-6 and Fig. 2-7. Grease all exposed metal surfaces of the battery terminals.

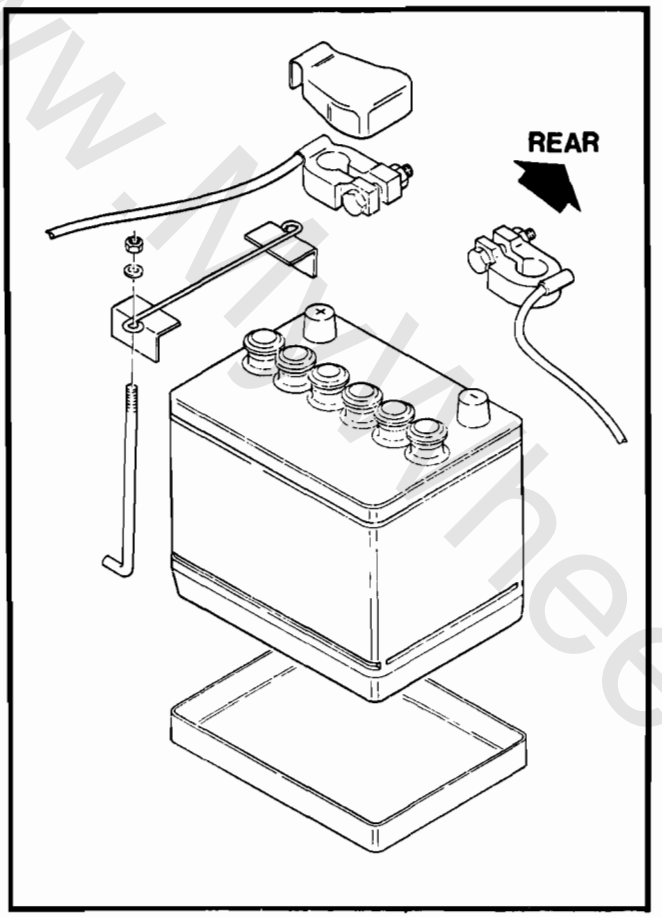


Fig. 2-7 D-Series Battery Installation

Check Engine Oil Level

Check that the engine oil is at the proper level and for oil leaks. Engines are filled with SAE 30 oil at the factory. If the tractor is to be operated in cold temperatures, it may be necessary to change the oil. Refer to the Engine Oil Temperature-Viscosity Chart in Section 1.

Check Transmission Oil Level

Check that the transmission oil is at the proper level and for oil leaks. Oil specifications are:

4-Speed Transmission – SAE 90
8-Speed Transmission – SAE 140
Automatic Transmission – SAE 10W-30 to 10W-40

Install Seat (C and D-Series Only)

Mount seat to seat springs with lockwashers and bolts on C-Series models. The seat springs are secured to the bottom of seat pivot plate on D-Series tractors. Remove the hardware and re-attach seat springs to top side of seat pivot plate. See Fig. 2-8.

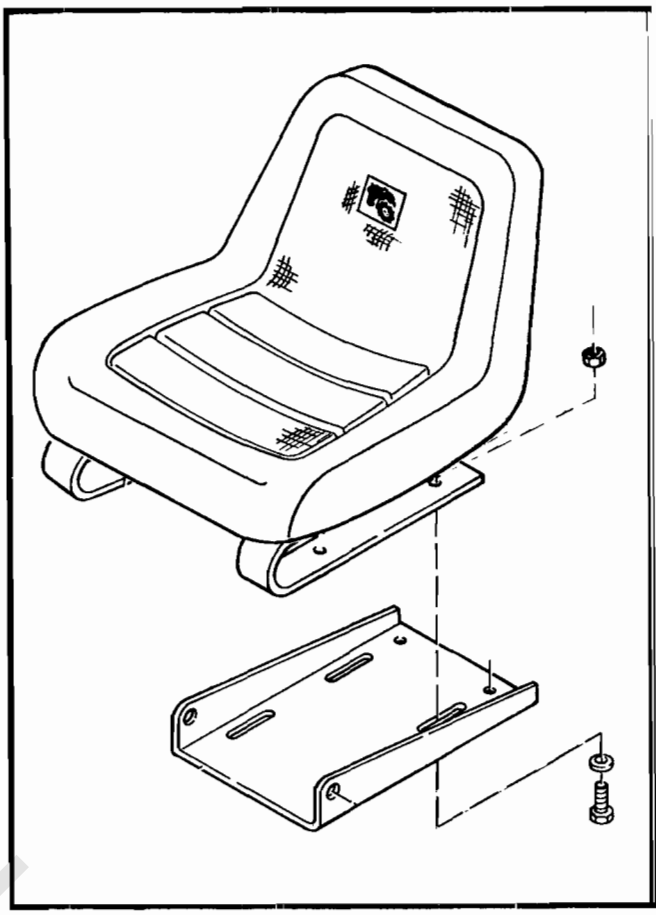


Fig. 2-8 D-Series Seat Installation

Check Wiring and Attaching Hardware

Visually inspect for any loose connections and tighten as required. Check routing of wires to make sure they will not be disturbed by any moving part that could cause a short.

Check that nuts, bolts, and other fasteners are in place and tight.

Fill the Fuel Tank

Use a good grade of regular or unleaded gasoline (90 octane or higher). Open the fuel shut-off valve and check fuel hose and fittings for leaks.

Lubricate Tractor

Grease all lube points as shown in the maintenance section of the tractor Owner's Manual (front axle, both front wheel spindles, both front wheels, and steering gear; on D-Series tractors, also grease the steering gear bell crank). Use No. 2 multi-purpose lithium grease.

Test Tractor Operation

A. As applicable, check or test operation of the following:

1. Engine, choke, and throttle controls
2. Gauges

3. Lights
4. PTO clutch and brake
5. Lift system
6. Service and parking brakes
7. Transmission clutch
8. Transmission controls
9. Steering
10. Tractor operation in all speeds forward and reverse

B. Test operation of the safety interlock system. The engine should NOT start if:
   1. a) The clutch pedal is not depressed on manual transmission models.
      b) The brake/return to neutral pedal is not depressed on automatic transmission models.
   2. The PTO lever or switch is in the Engaged or On position.

   On models so equipped, also check the operation of the seat switch. With the engine running and the PTO engaged, rise off the tractor's seat – the engine should shut off.

C. On automatic transmission models, check that the transmission neutral adjustment is properly set. Operate the tractor under full throttle and allow it to thoroughly warm up. Bring the tractor to a stop using the brake/return to neutral pedal. Release the pedal; if the tractor "creeps" in either direction, set the neutral adjustment as described in Section 5.

Check Front Wheel Alignment (D-Series Only)

With the tractor's wheels straight ahead, there should be a small amount (1/16 to 1/8 inch/1.5 to 3 mm) of "toe-in" adjustment.

If required, adjust the steering as described in Section 8.

Install Drawbar Hitch Pin (C and D-Series Only)

Install the drawbar hitch pin in the drawbar hitch and secure with a hairpin cotter.

Install Mower Belt Adjustment Bolt (B-Series Only)

Thread the 3/8-16 nut onto the 3/8-16 x 2 full thread bolt; thread the bolt into the front side of the mower hanger bracket, located just behind the front axle. Tighten the nut against the bracket to secure.

C-161 TWIN

Follow procedure for C-Series.

NOTES

GENERAL MAINTENANCE

SECTION 3

MAINTENANCE CHECKLIST

SERVICE OPERATION	Before Each Use	After Each Use	Every 10 Hours	Every 25 Hours	Every 50 Hours	Every 150-200 Hours
Check:						
Engine Oil Level	X					
Battery Water Level	X					
Transmission Oil Level Automatic	X					
Transmission Oil Level Manual				X		
Tire Pressures			X			
Tightness of all Attaching Hardware				X		
Clean Engine Cooling Fins		X				
Clean Air Filter B-Series				X		
Clean Air Filter C & D-Series					X	
Lubricate Chassis				X		
Change Engine Oil (1)				X		
Replace Engine Oil Filter (D-Series)(1)					X	
Inspect Spark Plugs					X	
Replace Spark Plug(s)						X

Inspect Breaker Points	100 Hours
Replace Air Filter	100 Hours/One Year(2)
Change Transmission Oil (Automatic)	100 Hours/One Year(2)
Replace Transmission Oil Filter (Automatic) (1)	100 Hours/One Year(2)
Replace Fuel Filter (D-Series)	100 Hours/One Year(2)
Clean and Lubricate PTO Clutch (D-200)	100 Hours/One Year(2)

(1) Refer to text for initial service interval for new tractors.
(2) Whichever occurs first.

These service intervals are considered MAXIMUM under normal operating conditions. Increase frequency under extremely dirty or dusty conditions.

ENGINE OIL

Oil Level

Never overfill the engine crankcase with oil. The oil level must not exceed the "F" level on the dipstick.

B-SERIES

The oil level should be to the top of the oil fill tube.

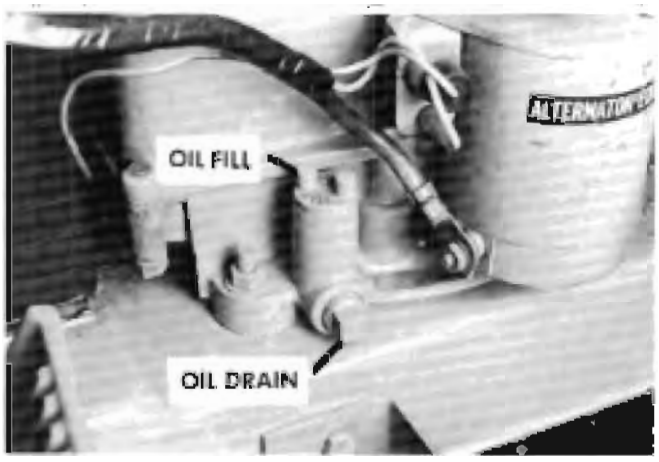


Fig. 3-1 B-Series Oil Fill and Drain Plugs

C-SERIES

On engines with oil filler tubes, remove the dipstick by twisting the cap slightly and pulling. Engines without oil filler tubes have a combination filler plug and dipstick located on the right side of the engine block.

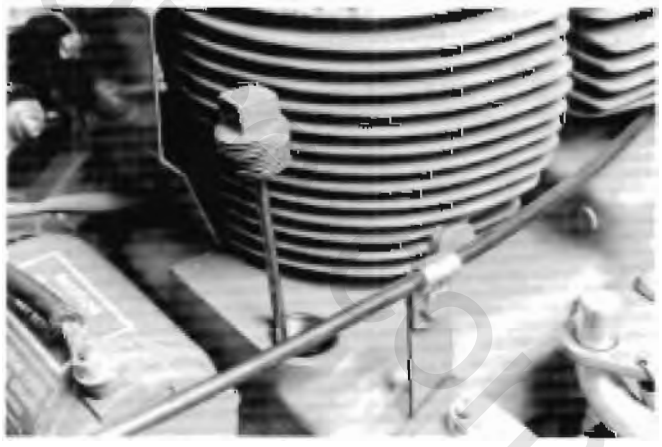


Fig. 3-2 C-Series Filler Plug Dipstick

D-SERIES

Remove the D-160 dipstick by twisting the cap slightly and pulling. The D-200 dipstick is removed by turning the cap counterclockwise and then pulling.

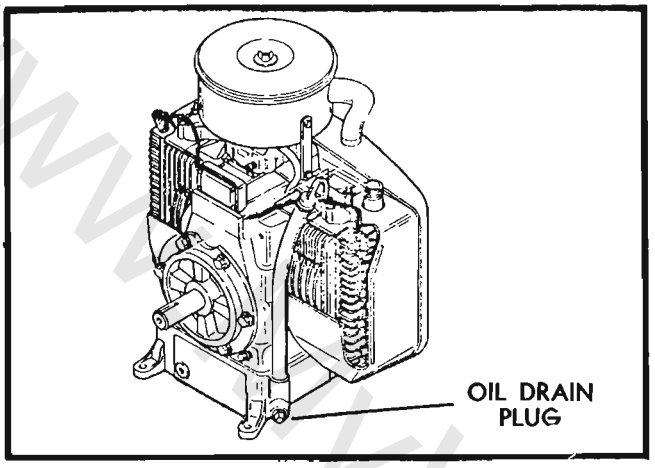


Fig. 3-3 D-160 Oil Dipstick and Drain Plug

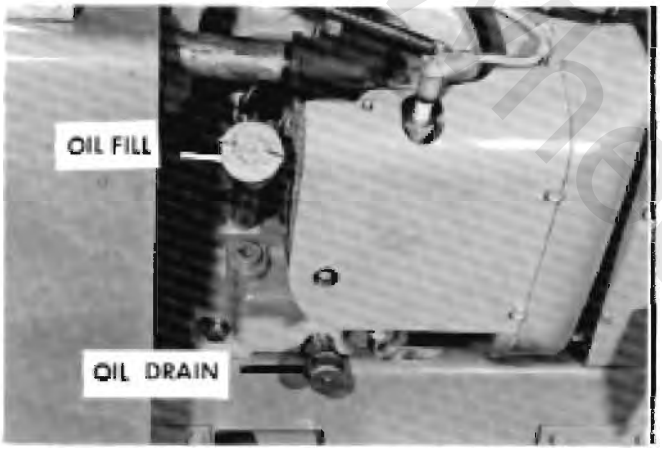


Fig. 3-4 Oil Dipstick and Drain Plug

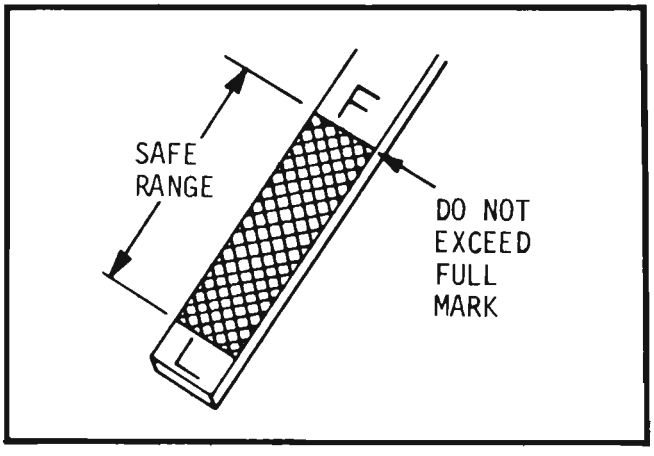


Fig. 3-5 Correct Oil Level — C and D-Series

Be sure to add the same viscosity oil as is presently in the engine. New tractors are shipped with SAE 30 oil in the crankcase. It may be necessary to change the original oil before using the tractor if the tractor will be operated in cold weather.

Oil Changes

> Failure to change the engine oil (and oil filter on D-Series models) at recommended intervals can lead to serious damage to the engine. This is especially true when using detergent oils which are designed to hold impurities in suspension; when the saturation point is reached, the oil may suddenly break down to form a gelatin-like substance which seriously impairs and can even stop the flow of oil. Increase the frequency of oil and oil filter changes if the tractor is operated under extremely dusty conditions.

Before changing the oil, start the engine and allow it to warm up. This will allow the oil to flow more freely. Shut off the engine and remove the key.

After adding the prescribed amount of oil, check the oil level. Add oil as necessary to bring the oil to the "Full" level in B-Series engines or into the "Safe" range on the dipstick in C and D-Series engines.

> NEVER overfill the engine crankcase with oil. The oil level must not exceed the "F" level on the dipstick.

Oil Filter (D-160, D-200)

The engine in D-160 and D-200 tractors is equipped with a full flow oil filter. The filter should be replaced along with the engine oil after the first 2 hours of operation. Thereafter, the filter should be replaced at 50 operating hour intervals (every second oil change), or sooner if the tractor is operated under extremely dusty conditions.

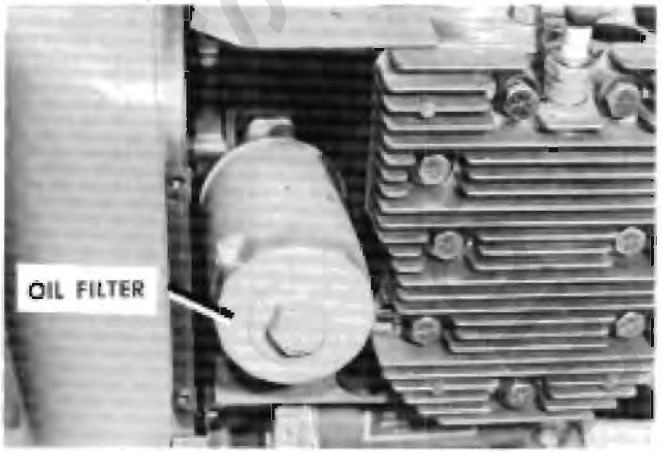


Fig. 3-6 Right Side Engine Baffle Removed, D-200

Fig. 3-7 Engine Oil Filter, D-160

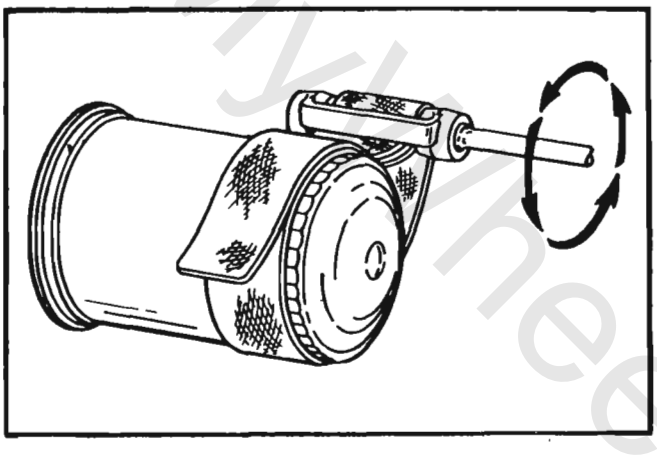


Fig. 3-8 Remove Oil Filter, D-Series

Hand tighten oil filter only; turn filter until the rubber gasket contacts the engine block, then tighten an additional 1/4 to 1/2 turn. Excessive tightening or use of a wrench or other mechanical device can cause damage to both the filter and the engine.

Air Filter

Clean the engine air filter on B-Series tractors after every 25 hours of operation, and after every 50 hours of operation on C and D-Series tractors (more often if the tractor is operated under extremely dusty conditions).

Replace dry type filter elements at 100 hour intervals, or once a year, whichever comes first. The foam type elements used on B-Series vehicles may be serviceable for more than 100 hours or one year of operation, provided the element shows no sign of deterioration and can still be cleaned satisfactorily. Replacement intervals must be shortened when operating under extremely dusty conditions. To protect the engine, use only the manufacturer's replacement filter, or replacement filters with equivalent specifications.

To prevent any dirt or other contaminants from entering the engine, always cover the carburetor air horn when the air cleaner is removed.

B-SERIES

To service the air filter, remove the two screws an lift off the complete air cleaner assembly. Remove th screen and spacers from the foam element and remov the element from the body of the air cleaner.

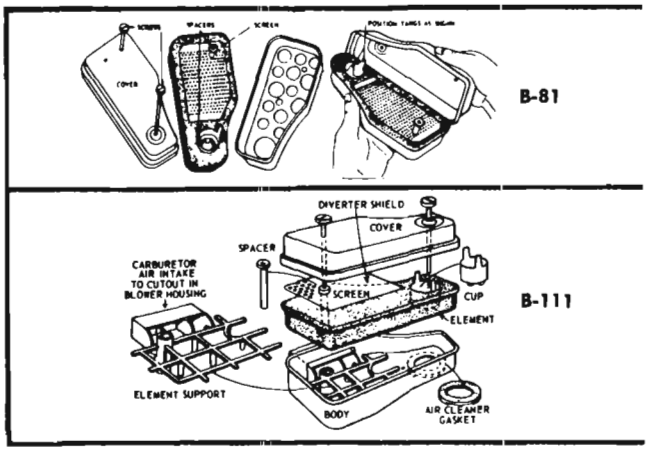


Fig. 3-9 B-Series Air Cleaners

Wash the foam element in a solution of liquid dete gent and water. Wrap the foam in a clean cloth an squeeze dry. Saturate the element in clean engine o (same viscosity as is presently being used in the engine and squeeze to remove excess oil.

When assembling, make certain the lip of the foa element extends over the edge of the air cleaner body

C-SERIES AND D-200

The dry type air filter element installed on C-Serie and D-200 engines is cleaned by tapping it lightly on flat surface to remove loose dirt particles. Replace th element if dirt does not drop off easily. DO NOT was elements in any liquid or attempt to blow dirt off wit compressed air as this will puncture the filter elemen

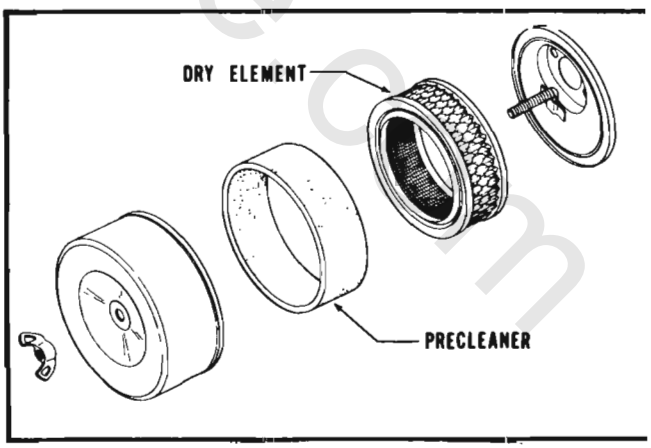


Fig. 3-10 C-Series and D-200 Air Cleaner

Check the following when installing a new or serviced element:

1. Back plate must be securely tightened to carburetor. Replace back plate if bent or cracked.
2. Gasket surfaces of element must be flat against back plate cover to seal effectively.
3. Wing nut must be finger tight — DO NOT OVER-TIGHTEN.

The D-200 and some C-Series engines are equipped with a precleaner slipped over the dry element, which traps much of the dirt and prevents it from entering the dry element. Servicing of the precleaner is accomplished by washing it in soap and water, rinsing, then squeezing out the excess water and allowing it to dry. DO NOT OIL THE PRECLEANER.

D-160

A dry type element with precleaner is used on the D-160's engine. Cleaning of the filter element, plus the checks to make when installing a new or serviced element, are the same as described in this section under "C-Series and D-200." The precleaner is serviced as described in the following paragraph.

To clean the precleaner, wash in water and detergent, remove excess water by squeezing like a sponge and allow to thoroughly dry. Distribute three tablespoons of SAE 30 engine oil evenly around the precleaner.

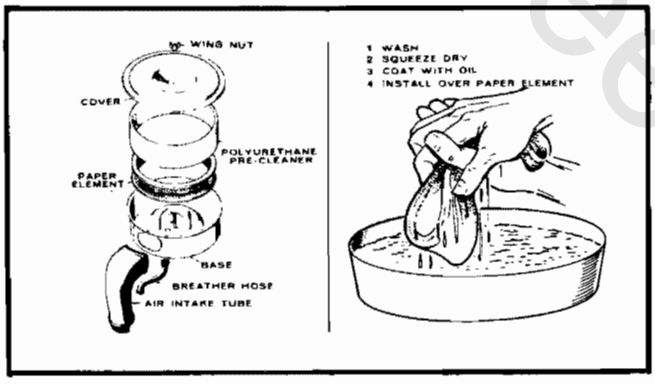


Fig. 3-11 D-160 Air Cleaner

BATTERY CHECK

A hydrometer is used to measure specific gravity of the battery. The water level in the battery should be at normal height when a hydrometer reading is taken. Hydrometer readings should never be taken immediately after water has been added. The water should be thoroughly mixed with the electrolyte, by charging, before hydrometer values are reliable.

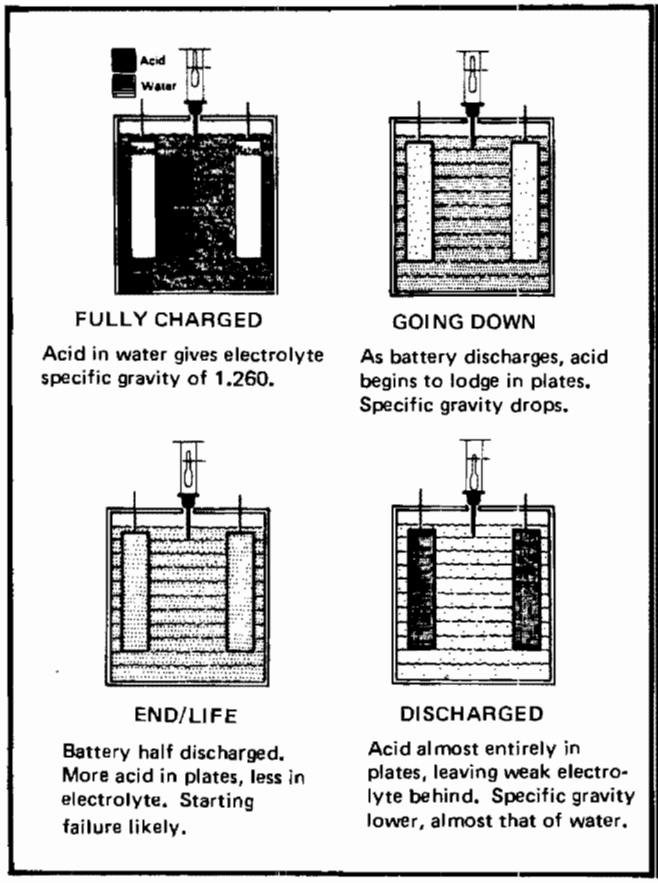


Fig. 3-12 Battery Chemistry

In reading a hydrometer, the barrel must be held vertically. Draw just enough acid into the barrel to lift the float. The float should not touch any part of the barrel.

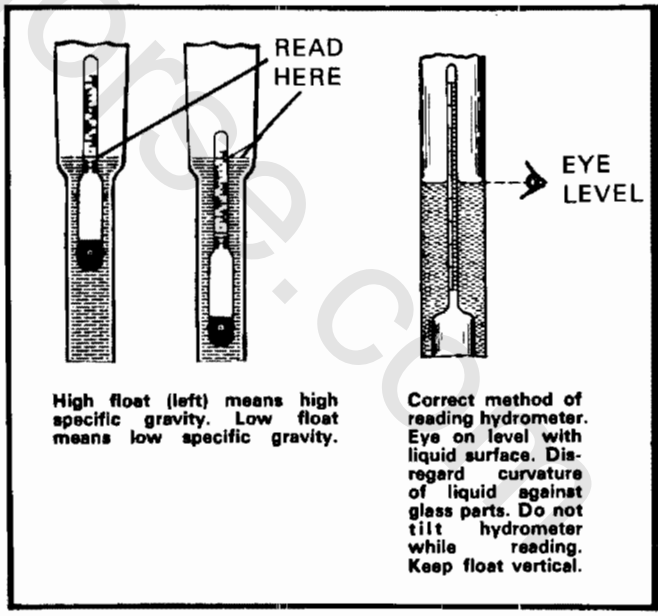


Fig. 3-13 Reading Hydrometer

Fuel Filter (D-Series)

D-Series tractors are equipped with an in-line fuel filter. This filter should be replaced after each 100 hours of operation or at 1 year intervals, whichever occurs first.

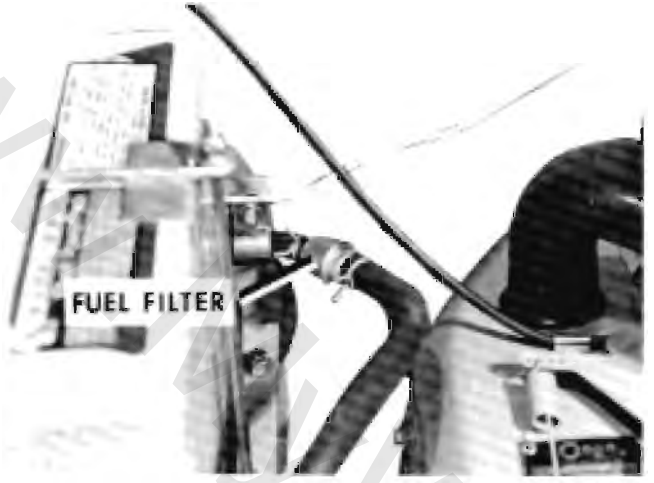


Fig. 3-14 D-160 Fuel Filter

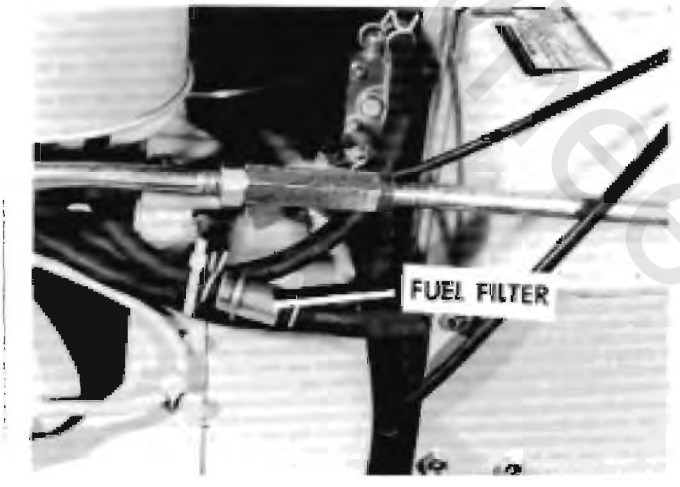


Fig. 3-15 D-200 Fuel Filter

TUNE UP PROCEDURE

Spark Plugs

Replace spark plugs that are not in good condition. Never sandblast, wire brush, scrape, or otherwise service spark plugs in poor condition. Best results are obtained with new plugs.

Always check the spark plug gap before installing new plug(s) or reinstalling the original plug(s). Use a spark plug gap gauge to adjust the electrode air gap.

Tractor Model	Plug Gap
B-Series	.030 in. (.8 mm)
C-Series & D-160	.025 in. (.6 mm)
D-200	.035 in. (.9 mm)

Tighten spark plug(s) to 22 ft. lbs. (30 Nm).

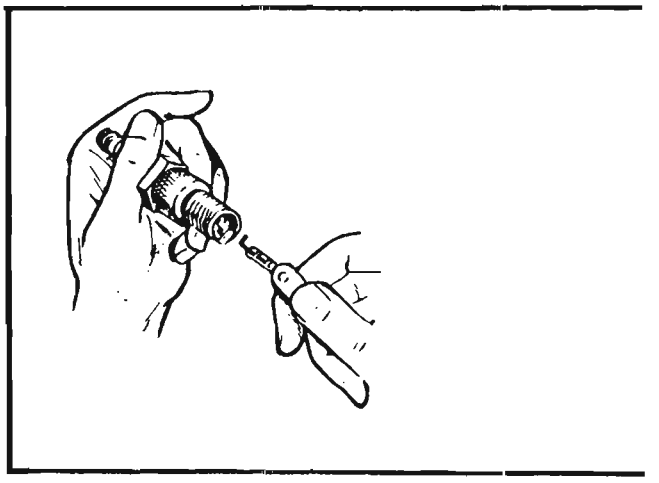


Fig. 3-16 Spark Plug Gap Adjustment

Points and Condenser

B-SERIES

The breaker points on Briggs & Stratton engines are located under the flywheel. Refer to Briggs & Stratton Service and Repair Instructions (Briggs & Stratton Part Number 270962) for correct flywheel removal procedures.

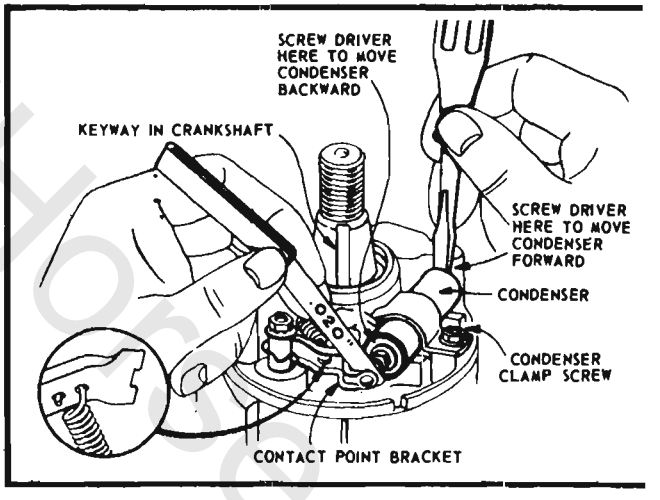


Fig. 3-17 B-Series Breaker Points

C-SERIES & D-200

1. Remove the breaker point cover.
2. Turn the engine over until the breaker points are fully opened.
3. Check the condition of the point surfaces. Always replace burned or pitted points. Dirty or oily points can be cleaned with a cloth, but make sure no particles of lint remain between point surfaces.
4. Measure the gap with a feeler gauge. When the points are fully open, the gap should be .020 inch (.5 mm). Adjust points as necessary.

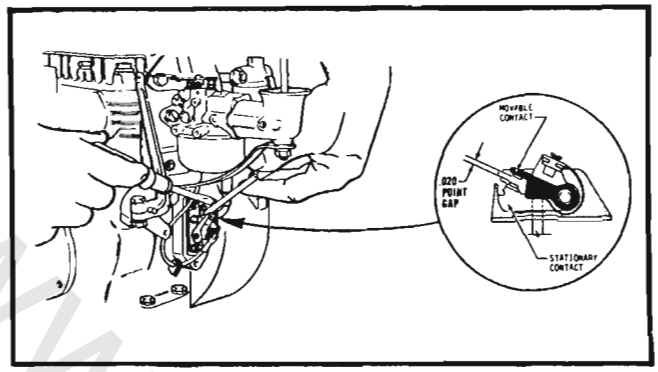


Fig. 3-18 C-Series Breaker Points

Fig. 3-19 D-200 Breaker Point Adjustment

Under normal operating conditions, a certain amount of buildup or metal transfer between the point surfaces will occur. If this occurs too frequently and becomes excessive, the condenser may be at fault.

D-160

The points are located on the top of the front side of the engine inside a breaker box.

To check the breaker points, with a cold engine, remove the two nuts holding the heat baffle to the top of the engine and remove the heat baffle. Use the following procedure to check and adjust breaker points gap.

1. Remove the two screws and the breaker box cap.
2. Remove the two spark plugs so the engine can be turned by hand. Check the condition of the spark plugs at this time.
3. Turn the engine over until the breaker points are fully opened.
4. Check the condition of the breaker point surfaces. Always replace burned, or pitted points. Dirty or oily points can be cleaned with a cloth, but make sure no particles of lint remain between point surfaces.
5. If point replacement is necessary, replace the breaker points with a new set. Adjust point gap to an initial setting of .023 inch (.6 mm).
6. Remove the air intake hose that connects to the blower housing. This provides an access to viewing the timing mark.

Fig. 3-20 D-160 Breaker Point Gap

7. Check the ignition timing by connecting a continuity light across the ignition breaker points. Connect one lead from the light to the negative side of the ignition coil (terminal that leads into the breaker box to the breaker points). Ground the other lead of the light to a good ground on the engine.
8. Turn the engine crankshaft counterclockwise until the points close. The light should now be on.
9. Slowly turn the crankshaft clockwise. Adjust the point gap so the lamp goes out as the timing mark on the flywheel aligns with the 25° BTC (before top center) mark.

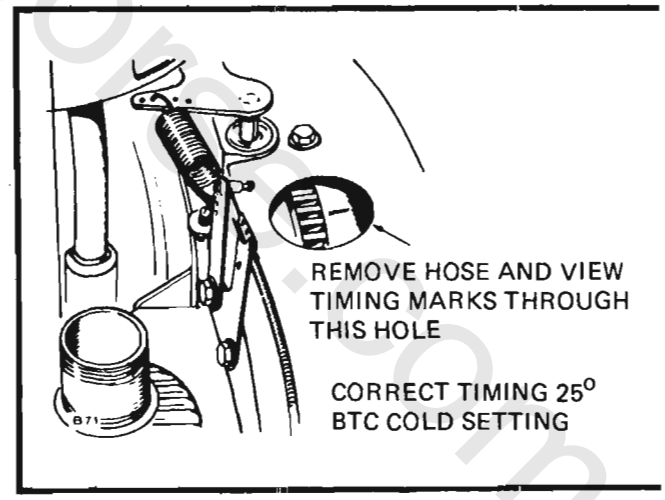


Fig. 3-21 D-160 Timing Mark

Under normal operating conditions, a certain amount or buildup or metal transfer between the point surfaces will occur. If this occurs too frequently and becomes excessive, the condenser may be at fault.

Timing

B-SERIES, C-SERIES, AND D-160

Ignition timing on the B, C, and D-160 models is controlled by the point gap setting. Refer to Points and Condenser.

D-200

The ignition timing should be checked each time the breaker point gap is altered.

To check the ignition timing connect an automotive type timing light to the high tension lead of the left spark plug. Consult the manufacturer's instruction for exact connections of the particular type of timing light used.

Rotate the engine until the "SP" mark is observed in the timing sight hole; using a piece of chalk, mark the line for easier reading.

Fig. 3-22 Timing the D-200

Start the engine and run at 1/2 throttle or above. Aim the timing light into the sight hole; the light should flash just as the "SP" mark is centered in the hole. If the light flashes before the mark is centered, the timing is excessively advanced. If the light flashes after the mark is centered, the timing is excessively retarded.

To adjust, loosen (DO NOT REMOVE) governor flange mounting capscrews and rotate the governor until the timing mark is centered exactly in the sight hole. Retighten flange mounting screws after exact timing is achieved.

Fig. 3-23 Governor Flange Mounting Screws

Carburetor Adjustment

Carburetors are adjusted in the factory and should not have to be reset. If however, one of the following conditions is noted, the carburetor should be readjusted immediately as continued operation with incorrect setting can lead to fouled spark plugs, overheating, excessive valve wear, or other problems. If black exhaust smoke is noted, check the air cleaner first – an "overrich" mixture is usually caused by a poorly serviced, clogged air cleaner element, not an improperly adjusted carburetor.

CONDITION
A. Black, sooty exhaust smoke, engine sluggish.
B. Engine misses and backfires at high speed.
C. Engine starts, sputters, and dies under cold weather starting.
D. Engine runs rough or stalls at idle speed.

POSSIBLE CAUSE/PROBABLE REMEDY
A. Mixture too rich – readjust main fuel needle.
B. Mixture too lean – readjust main fuel needle.
C. Idle speed too low or improper idle adjustment – readjust speed, then idle fuel needle if needed.

If readjustment becomes necessary, stop the engine, then turn the MAIN and IDLE fuel adjusting screws all the way in until they bottom LIGHTLY – don't force them closed, as this will damage the needle valves.

For preliminary settings, refer to the chart below.

INITIAL CARBURETOR ADJUSTMENT CHART

	B-Series	C-Series	D-160	D-200
Main Fuel Valve	1 1/8 turns	2 turns	1 1/8 turns	2 turns
Idle Valve	1 1/8 turns	1 1/4 turns	1/2 - 1 turns	1 1/4 turns

For final adjustments, start engine and allow it to warm up, then operate at full throttle. Turn MAIN fuel in until engine slows down (lean side), then out until it slows down again from overrich setting – note positions of screw at both settings, then set it about halfway between the two. The IDLE fuel setting can then be adjusted in the same manner for smoothest idle. Rough idle is often due to the idle speed being set too low – check this also.

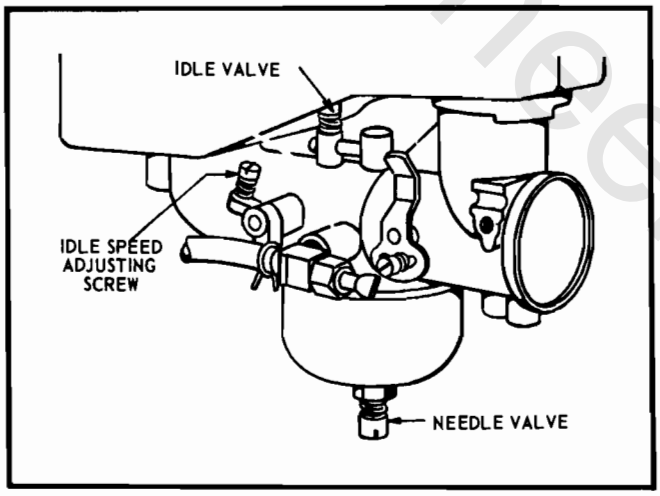


Fig. 3-24 B-Series Carburetor Adjustment

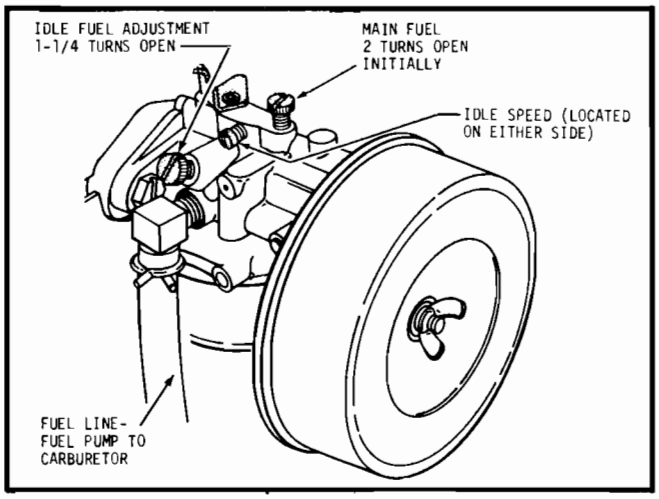


Fig. 3-25 C-Series Carburetor Adjustment

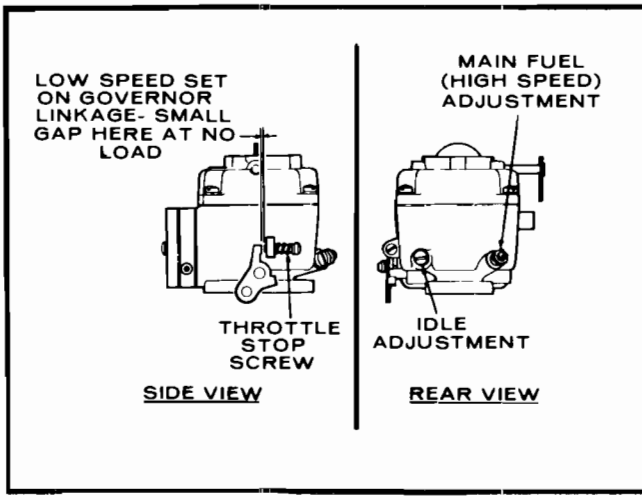


Fig. 3-26 D-160 Carburetor Adjustment

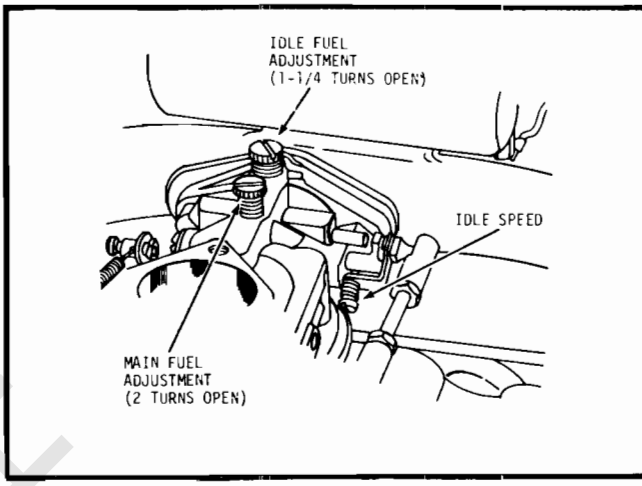


Fig. 3-27 D-200 Carburetor Adjustment

C-161 TWIN

ENGINE OIL — Same as C-Series.

AIR FILTER — Same as C-Series except: saturate the precleaner in engine oil and squeeze to remove excess oil.

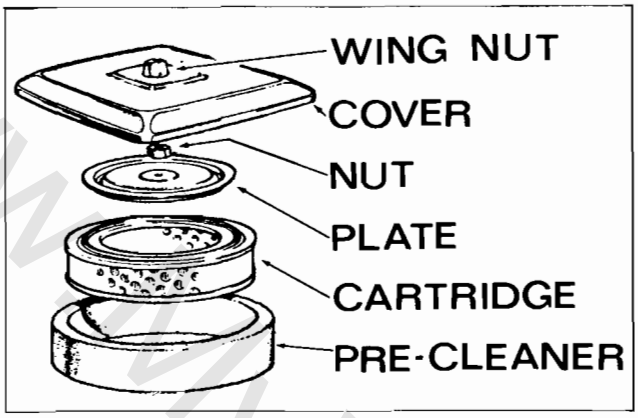


Fig. 3-28 C-161 Twin Air Filter

BATTERY CHECK — As described on page 3-4.

TUNE-UP PROCEDURE

Spark Plugs — Same as B-Series.

Points and Condenser— The breaker points on Briggs & Stratton engines are located behind the flywheel. Refer to Briggs & Stratton "Twin Cylinder Service Instructions" (Briggs & Stratton Part Number 271172) for correct service procedures.

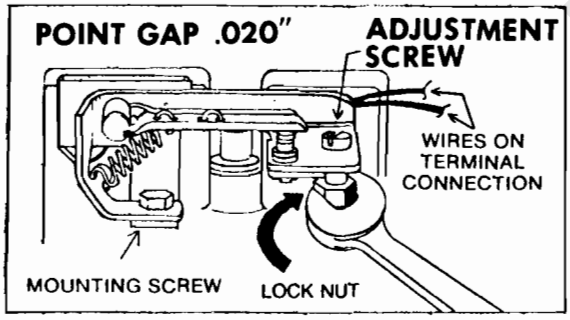


Fig. 3-29 C-161 Twin Breaker Points

TIMING — Same as C-Series.

CARBURETOR ADJUSTMENT — Turn needle valve clockwise until it just closes. VALVE MAY BE DAMAGED BY TURNING IT IN TOO FAR. Now open needle valve 1½ turns counterclockwise. Close idle valve in same manner and open 1½ turns. This initial adjustment will permit the engine to be started and warmed up prior to final adjustment. See Fig. 3-30.

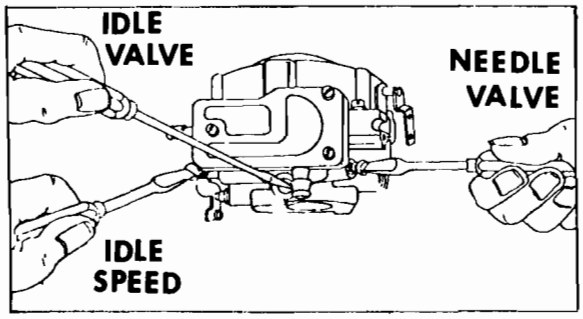


Fig. 3-30 C-161 Twin Carburetor Adjustment

FINAL ADJUSTMENT

1. **Place governor speed control lever in "IDLE" position. Hold throttle lever against idle stop and set idle speed adjusting screw to obtain 1450 R.P.M. Turn idle valve slowly clockwise (lean mixture) until engine misses or R.P.M. slows. Then turn idle valve ½ turn counterclockwise.**
2. **Hold throttle shaft in closed position and adjust idle speed screw to 900 R.P.M. Release the throttle. With remote control in idle position, adjust tab "A" to obtain to 1450 R.P.M. See Fig. 3-31.**

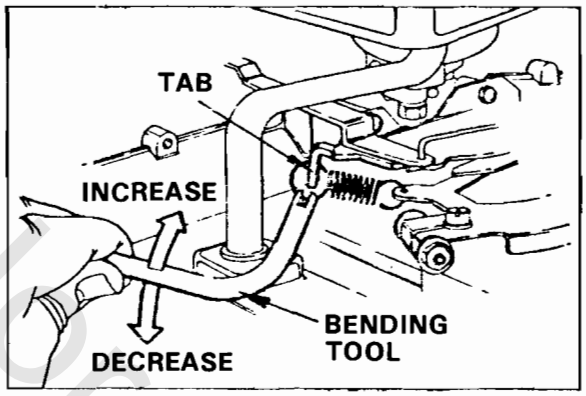


Fig. 3-31 C-161 Twin Governor Idle Spring

NOTE: Governed idle must be adjusted on all engines for proper operation. The smaller spring keeps the engine on governor, even at idle speed. If moderate loads are applied at idle, the engine will not stall. Idle speed should be no lower than 1100 R.P.M.

3. **Place governor speed control lever in fast position. Then turn needle valve in slowly clockwise (lean) until engine misses or R.P.M. slows. Then turn needle valve ½ turn counterclockwise.**

   If engine does not accelerate properly, readjust needle valve approximately ⅛ turn counterclockwise (richer).

ENGINE

CHOKE AND THROTTLE CONTROL ROUTING AND ADJUSTMENT

B-SERIES

Choke cable is located on left side of dash panel and parallels gas line to carburetor. See Fig. 4-1. Adjust choke by loosening cable retainer clamp at carburetor end. Set choke handle in full COLD position. Then tighten retainer clamp to hold choke butterfly in fully closed position.

Throttle cable is located on right side of dash panel leading from control handle to governor. See Fig. 4-1. Adjust throttle by loosening cable retainer clamp at engine. Set throttle handle to full OPERATE position. Tighten retainer clamp to hold throttle in fully open position.

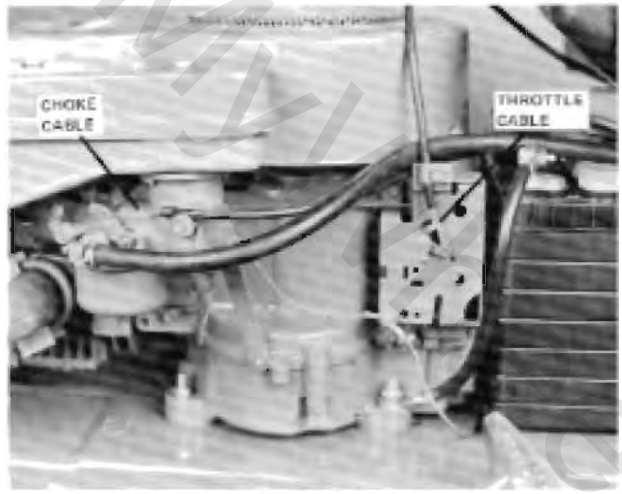


Fig. 4-1 B-Series Choke and Throttle Linkage

C-SERIES

Choke cable is located on left side of dash panel. It passes around bottom of engine through two cable clips and into a retainer clamp at carburetor. Adjust choke by loosening cable retainer clamp at carburetor. Set handle in full COLD position and tighten retainer clamp to hold choke butterfly in fully closed position. See Fig. 4-2.

C-81 (Only)

Throttle cable is located on right side of dash panel, leading under engine into a retainer clamp. End of throttle wire inserts into first hole above stop pin. See Fig. 4-3. Adjust throttle by loosening cable retainer clamp. Set throttle handle to full OPERATE position. Tighten retainer clamp with throttle in fully open position and stop pin against bracket.

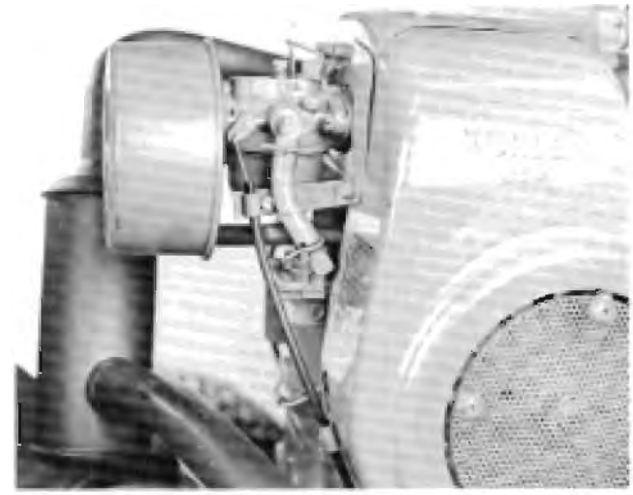


Fig. 4-2 C-81 Choke Linkage

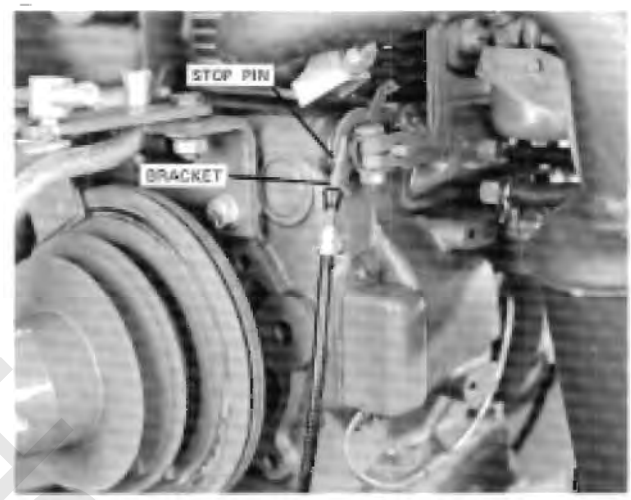


Fig. 4-3 C-81 Throttle Linkage

C-SERIES (Except C-81)

Throttle cable is located on right side of dash panel. It passes through a cable clip on right side of engine into throttle control bracket. See Fig. 4-4. To adjust, place throttle in full OPERATE position. Loosen throttle setscrew and rotate throttle control bracket clockwise to stop position. Tighten throttle cable setscrew.

D-SERIES

D-160

Choke cable is routed from control handle, around battery, through retainer clip on engine to choke lever on carburetor. Adjust choke with choke handle in the COLD-START position. Loosen cable clamp on engine. Tighten cable clamp to hold choke butterfly in closed position. See Fig. 4-5.

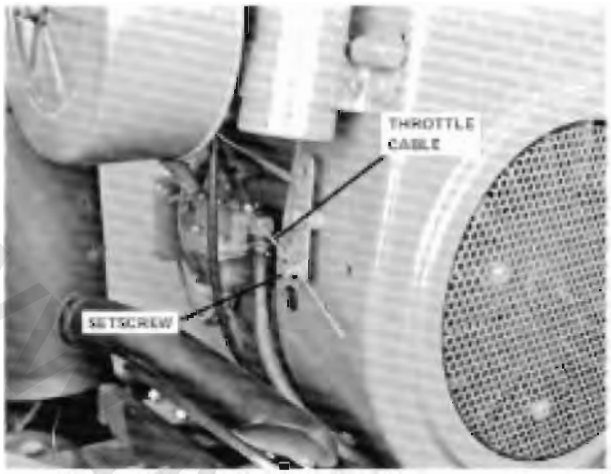


Fig. 4-4 C-Series (Except C-81) Throttle Linkage

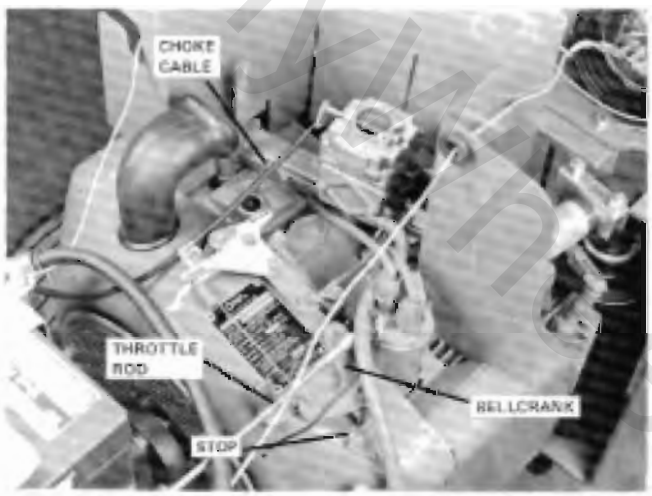


Fig. 4-5 D-160 Choke and Throttle Linkage

Throttle linkage consists of a control rod attached to throttle lever with a cotter pin. Forward end of rod is attached to throttle governor bellcrank with ball swivel bolt.

Adjust the throttle by placing throttle control lever in FAST position. Adjust ball swivel stud so bellcrank contacts rear stop.

D-200

Choke cable is routed from control handle through cable clamp on top of engine to choke lever on carburetor. Adjust choke same as D-160. See Fig. 4-6.

Throttle linkage consists of a control rod from throttle lever attached to governor control bellcrank at second hole from top. Adjust throttle same as D-160.

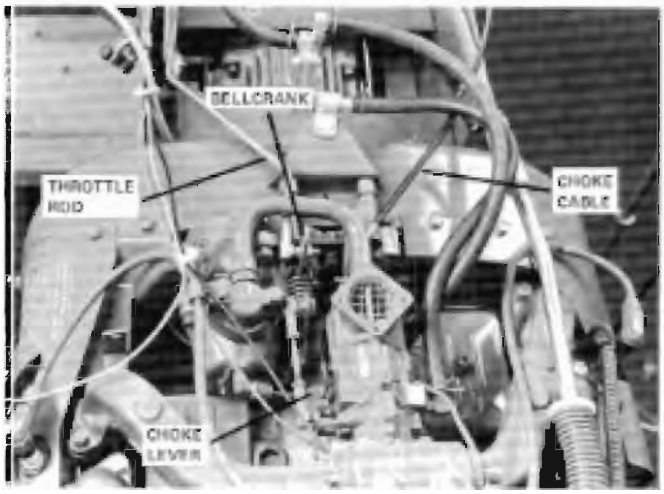


Fig. 4-6 D-200 Choke and Throttle Linkage

ENGINE — REMOVE AND REPLACE

For engine repair operations, refer to engine manufacturer literature (Briggs and Stratton or Kohler) or Wheel Horse Onan Engine Repair Manual.

B-SERIES

1. Remove negative battery cable.
2. Disconnect choke and throttle cables, fuel line, and all four electric lines: magneto ground (green), alternator/lights (yellow), alternator/charge (red), starter (black).
3. Separate PTO linkage under frame by removing clevis pin and hairpin cotter at PTO clutch turnbuckle.
4. Remove PTO brake adjustment screw and bracket.
5. Remove PTO clutch cone assembly.
6. Remove crankshaft bolt and bearing race.
7. Relieve drive belt tension by depressing clutch pedal and remove remaining PTO clutch housing from crankshaft.
8. Remove four (4) engine mounting bolts and lift engine off frame.

For engine installation, reverse removal procedure. See Fig. 4-7.

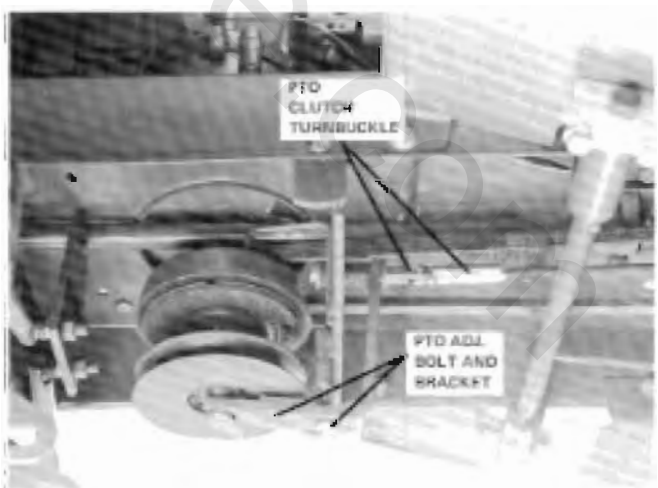


Fig. 4-7 B-Series Engine and Clutch Removal

C-SERIES

1. Remove negative battery cable.
2. Disconnect choke and throttle cables, fuel lines, and all electric lines:

   red – 2 wires to solenoid
   battery cable to solenoid
   black – coil
   rectifier regulator plug
   orange – rectifier plug
3. Remove the belt guard.
4. Remove the hairpin cotter from the PTO clutch rod.
5. Remove the PTO shaft clevis pin, and pivot yoke away from shaft.
6. Remove the PTO brake.
7. Disengage the transmission drive clutch on automatic models or depress clutch on 8-speed models.
8. Remove drive belt from the transmission drive pulley and slide belt forward to clear engine pulley.
9. Remove through bolts from front isomounts.
10. Remove nuts securing rear isomount block to frame.
11. Remove engine with rear block still attached. See Fig. 4-8.

For engine installation:

1. Align front isomount through bolt with front block, but do not tighten.
2. Maneuver rear block so studs drop through holes in frame and secure with nuts.
3. Tighten all mounting bolts.

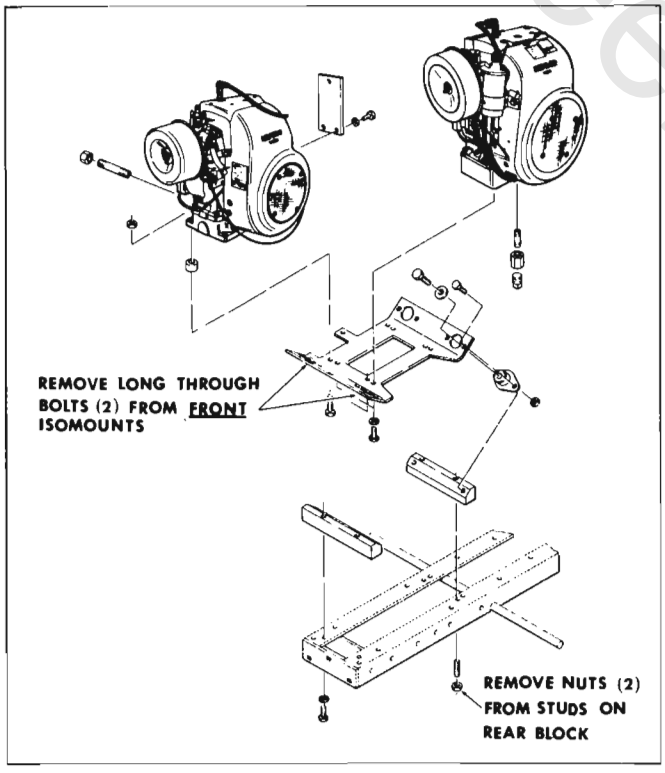


Fig. 4-8 C-Series Engine Mounting

D-SERIES

D-160

1. Remove negative battery cable.
2. Disconnect choke and throttle controls, and fuel line from fuel pump.
3. Disconnect electric wires to coil, starter, orange wire to rectifier plug, headlights, and PTO clutch. Mark wire colors for replacement.
4. Remove grille.
5. Remove upper muffler clamps, and four (4) bolts on grille shroud.
6. Remove mufflers and complete hood and grille shroud assembly.
7. Remove four (4) bolts holding engine to frame and slide engine forward until the flex coupling slides off pump drive shaft.
8. Remove the engine from the frame.

For installation, reverse removal procedure. Take special note when assembling the flex coupling. See Fig. 4-9 and special instructions in Section 1.

Fig. 4-9 D-160/D-200 Flex Coupling

D-200

1. Remove negative battery cable.
2. Disconnect choke and throttle controls and fuel line from fuel pump.
3. Disconnect electric wires to coil, starter, headlights, and orange wire to rectifier plug. Mark wire colors for replacement.
4. Remove mufflers and complete hood and grille shroud assembly.
5. Disconnect the PTO rod trunnion from the clutch bar.
6. Remove four (4) bolts holding engine to frame and slide engine forward until the flex coupling slides off pump drive shaft.
7. Remove the engine from the frame.

For installation, reverse removal procedure. Take special note when assembling the flex coupling. See Fig. 4-9 and special instructions in Section 1

C-161 TWIN

CHOKE AND THROTTLE CONTROL ROUTING AND ADJUSTMENT

The choke control is located on the left side of the dash panel. The choke cable runs over the top of the engine and connects to the rear of the carburetor. Set the handle in the RUN position and tighten the retaining clamp to hold the choke butteryfly in the full open position.

The throttle control is located on the right side of the dash panel. The throttle cable runs over the top of the engine and connects to the governor linkage at the top of the engine. Set the throttle to the full OPERATE position and tighten the clamp to hold the throttle in the fully open position.

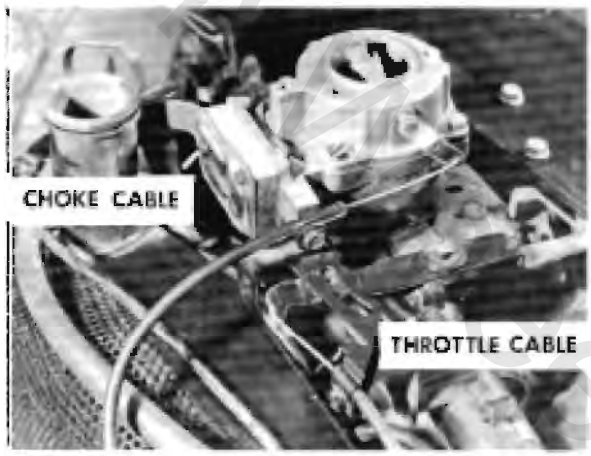


Fig. 4-10 C-161 Twin Choke and Throttle Controls

ENGINE — REMOVE AND REPLACE

1. Remove negative battery cable.
2. Disconnect choke and throttle cables, fuel lines, hood stop cable, and all electric lines:

   battery cable to solenoid
   black — magneto ground
   red & yellow — alternator plug
3. Remove the belt guard.
4. Remove the hairpin cotter from the PTO clutch rod.
5. Remove the PTO shaft clevis pin, and pivot yoke away from shaft.
6. Remove the PTO brake.
7. Disengage the transmission drive clutch on automatic models or depress clutch on 8-speed models.
8. Remove drive belt from the transmission drive pulley and slide belt forward to clear engine pulley.
9. Remove through bolts from front isomounts.
10. Remove nuts securing rear isomount block to frame.
11. Remove engine with rear block still attached. See Fig. 4-8.

FOR ENGINE INSTALLATION:

1. Align front isomount through bolt with front block, but do not tighten.
2. Maneuver rear block so studs drop through holes in frame and secure with nuts.
3. Tighten all mounting bolts.

NOTES

CLUTCH, BRAKES, TRANSMISSION/TRANSAXLE

B-SERIES

Clutch

Transmission is disengaged from the engine by clutching the drive belt.

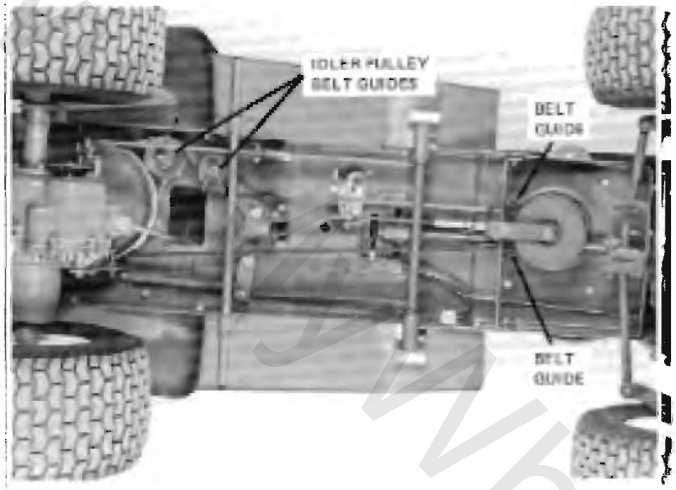


Fig. 5-1 B-Series Belt Routing and Linkage

Idler Pulleys

Two idler pulleys are used on the drive belt. A flat pulley is located on the idler lever, and a V pulley is stationary. No adjustment can be made to either pulley.

Belt Guides

Both idler pulleys use wire type belt guides. The guides can rotate around the pulleys and must be correctly adjusted.

To adjust the belt guides, loosen the nuts holding the guides and move the guides to positions shown in Fig. 5-1. Tighten nuts securely.

Two belt guides are used to capture belt at engine pulley. These guides should be adjusted to 1/16 inch (1.5 mm) from drive belt with the clutch pedal released.

Belt Replacement

1. Place gear shift lever in neutral.
2. Separate PTO linkage under frame by removing clevis pin and hairpin cotter at PTO clutch turnbuckle.
3. Remove PTO brake adjustment screw and bracket.
4. Remove PTO clutch cone assembly.
5. Remove crankshaft bolt and bearing race.
6. Relieve drive belt tension by depressing clutch pedal and remove remaining PTO clutch housing from crankshaft.
7. Remove idler pulley belt guides.

> When removing belt guides, pulleys are free if nuts are not replaced.

8. Cut old belt or remove by working belt through gear shift access hole.
9. Feed half the new belt through gearshift access hole aft end and half around the gearshift lever through th access hole forward end.
10. Place forward end of belt over engine drive pulley, and re place pulley onto engine shaft and secure with bolt an race.
11. Place aft end of belt over transmission pulley.
12. Route belt around idler pulleys.
13. Replace belt guides and retaining nuts.
14. Release the clutch, check belt alignment, and set belt guides as shown in Fig. 5-1.
15. Replace PTO cone and linkage, and adjust PTO brake See Section 9.

Brakes

The B-Series employs a positive action disc type brake on the transaxle. See Fig. 5-2.

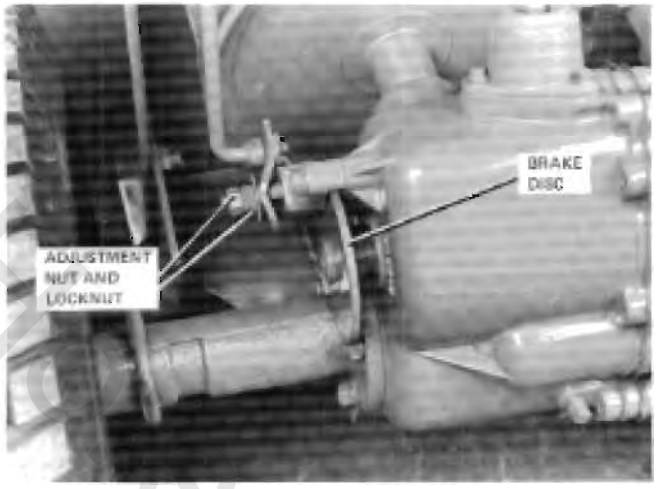


Fig. 5-2 B-Series Brake Adjustment

Brake Adjustment

1. Depress the foot brake and set parking brake in the first notch. See Fig. 5-3.
2. Loosen lock nut and tighten adjusting nut on brake cam lever. See Fig. 5-2.
3. Push or pull tractor by hand. Proper brake adjustment is achieved when rear wheels skid across floor.
4. Release brakes and check that brake disc turns freely.
5. Tighten the lock nut and recheck brake adjustment.

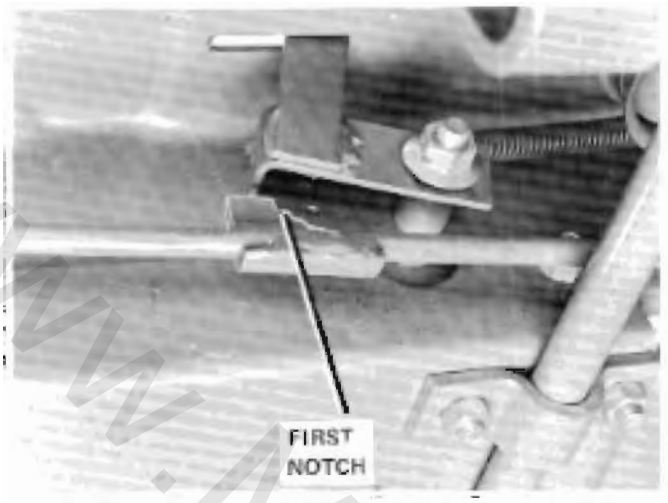


Fig. 5-3 B-Series Parking Brake Lever

Transaxle

For complete repair operations, refer to manufacturer's service manual for Peerless Model 669.

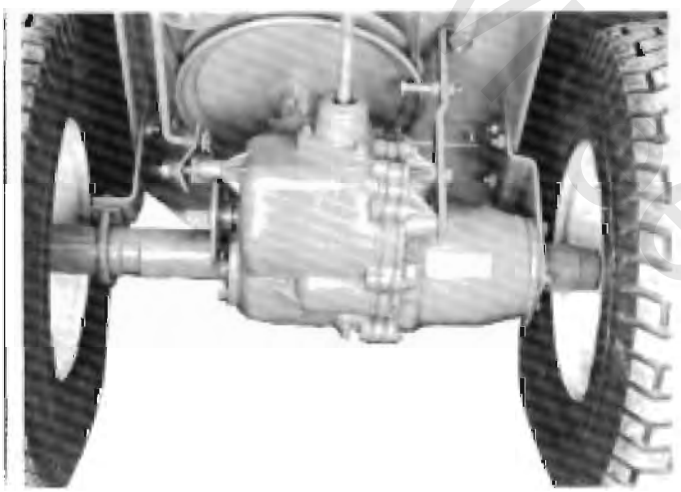


Fig. 5-4 B-Series Transaxle

Remove and Replace Transaxle

1. Lift tractor to relieve weight from transaxle.
2. Place gearshift lever in neutral.
3. Depress clutch and slip drive belt off transaxle pulley.
4. Disconnect brake lever and return spring at brake.
5. Remove 3 bolts from transaxle support bracket. Fig. 5-4.
6. Remove 6 bolts from axle support brackets at frame.
7. Raise tractor frame and remove transaxle while guiding gearshift lever through access hole and the belt.

Reverse above procedure for replacement.

C-SERIES

Clutch — 8-Speed Models

Transmission is disengaged from the engine by clutching the drive belt, located on the right side of vehicle. See Fig. 5-5.

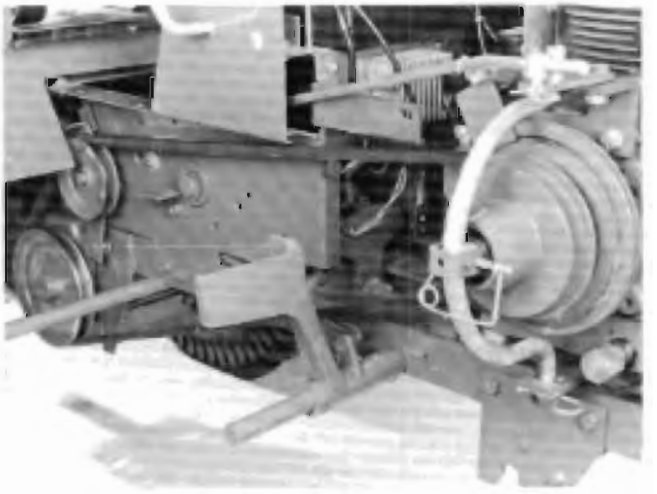


Fig. 5-5 C-Series 8-Speed Belt Routing

Clutch Rod Adjustment — 8-Speed Models

The 8-speed clutch rod adjustment is made to adjust clutch pedal position. To reposition pedal, adjust the position of the threaded trunnion on the clutch rod, at the left rear of the vehicle. See Fig. 5-6. The adjustment is more easily made by disconnecting the clutch rod at the clutch pedal.

Belt Guide Adjustment — 8-Speed Models

Belt guide tangs are located on the belt guard top and bottom front edge. To adjust, bend the guides with the belt under tension.

Belt Replacement — 8-Speed Models

1. Remove belt guard and right side foot rest.
2. Loosen clutch idler pulley.
3. Depress clutch and slip belt off rear drive pulley.
4. Remove PTO rod trunnion.
5. Remove yoke clevis pin and pull yoke aside.
6. Remove PTO brake.
7. Remove old belt and reverse procedure for new belt installation. Adjust PTO brake. See Section 9.

Brake — 8-Speed Models

The brake band, located on the left side of the transmission, brakes the transmission, and, in turn, brakes the rear wheels. See Fig. 5-6.

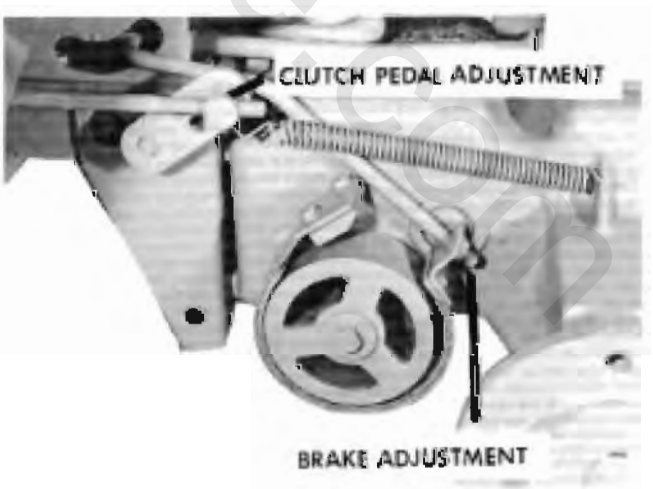


Fig. 5-6 C-Series 8-Speed Clutch Pedal and Brake Adjustments

Brake Adjustment – 8-Speed Models

1. Depress the brake pedal and engage parking brake.
2. With the parking brake engaged, adjust the nut on the end of the rod until the brake band is tight enough to skid both rear wheels when the tractor is pushed.
3. Tighten the nut another 1/2 turn.

When properly adjusted, the parking brake lever should not travel to the end of the slot when parking brake is engaged.

Transmission – 8-Speed Models

For complete repair operations, refer to Wheel Horse Mechanical Transmission Repair Manual No. A-1392.

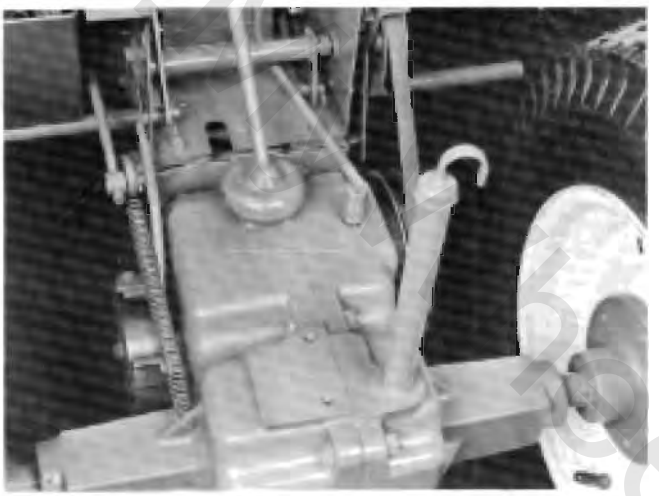


Fig. 5-7 C-Series 8-Speed Transmission

Remove and Replace Transmission – 8-Speed Models

1. Drain the transmission oil.
2. Remove gearshift and park brake knobs and shift cover plate.
3. Depress clutch pedal and slip belt off drive pulley.
4. Remove seat hinge brackets and seat.
5. Unbolt seat pan and disconnect seat switch wires and tail light wires if applicable.
6. Remove seat pan.
7. Remove two (2) bolts holding seat pan support bracket to top of transmission. Remove fuel line and conduit clamps, close fuel valve, and disconnect fuel line at tank.

> Secure fuel line to steering wheel to prevent fuel line from draining.

8. Remove two (2) bolts and nuts holding seat pan support bracket (not the fuel tank forward bolts).
9. Lift off fuel tank along with both brackets, and set tank aside.
10. Drive spirol pin from range selector lever.
11. Remove clutch return spring from transmission casting.
12. Disconnect rear brake rod at bellcrank.
13. Support frame of tractor and remove four (4) bolts holding transmission to frame. See Fig. 5-9.
14. Disconnect range lever as transmission is pulled away from frame.

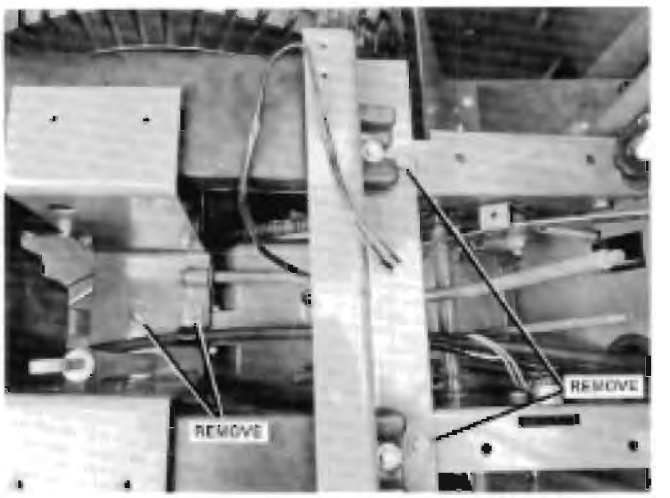


Fig. 5-8 C-Series 8-Speed Seat Pan Supports

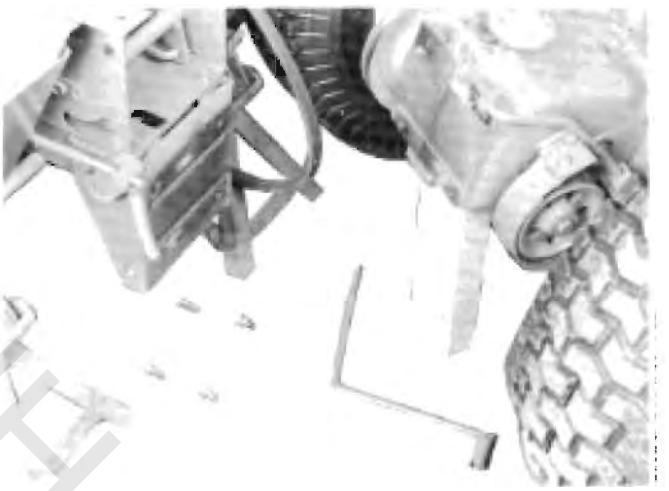


Fig. 5-9 C-Series 8-Speed Transmission Removed

To replace transmission, reverse above precedure. Refill with oil.

Clutch – Automatic Models

Transmission is disengaged from engine by clutching the drive belt located on the right side of vehicle. See Fig. 5-10.

Belt Guide Adjustment

Same procedure as 8-Speed.

Belt Replacement

Same procedure as 8-Speed, except that idler pulley need not be loosened.

Fig. 5-10 C-Series Automatic, Belt Routing

Brake/Motion Control Linkage — Automatic Models

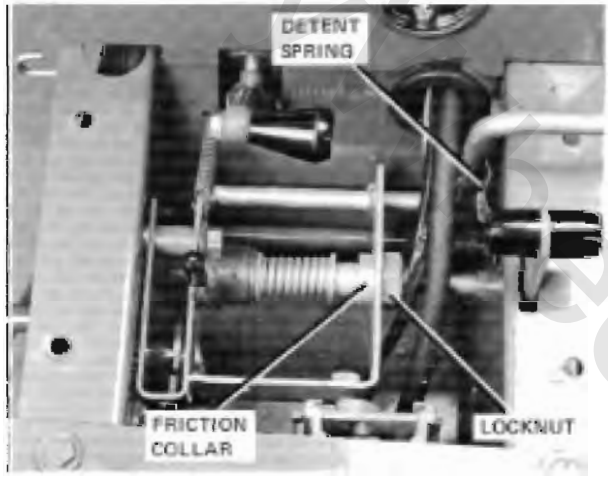


Fig. 5-11 C-Series Automatic, Motion Control Linkage

Motion Control Linkage Neutral Adjustment

Place the tractor on a level surface with engine running. Depress the brake pedal and release. The tractor should not creep and the rear wheels should be effectively locked.

If the tractor creeps on a level surface while in neutral, adjust as follows:

1. Block the rear wheels off the ground.
2. Remove controls cover plate located in front of the seat.
3. Loosen the set screws in the arm with an allen wrench. See Fig. 5-12.
4. Start the engine and run at full throttle. Engage the drive clutch. Allow drive train to reach normal operating temperature.
5. Depress the brake pedal fully and release.
6. Insert a short screwdriver through the hole in the nylon cam and rotate the eccentric cam pin until the rear wheels stop turning. This usually occurs at a point midway between forward and backward wheel rotation.

> The lobe on the eccentric pin must be up for proper adjustment.

7. Retighten the set screw in the arm and retest for neutral at full throttle.

> If the brake band is severely out of adjustment (too tight), proper neutral adjustment will not be possible due to restricted brake pedal travel. Loosen brake band adjustment nut completely, make the neutral adjustment, then adjust the brake band.

Fig. 5-12 C-Series Automatic, Motion Control Neutral Adjustment

Detent Alignment Adjustment

After neutral has been adjusted, check to see if the motion control lever is centered in the detent notch of the detent spring. The spring incorporates slotted bolt holes so it may be adjusted as required to line up the neutral notch with the control rod. See Fig. 5-11.

Motion Control Friction Adjustment

The speed control lever is friction-loaded to hold any selected speed in either direction. If the lever does not remain where it is set during operation, adjust as follows:

1. Remove controls cover plate.
2. Release large locknut. See Fig. 5-11.
3. Tighten friction collar to desired spring friction.
4. Tighten large locknut.

> The proper amount of friction is obtained when approximately 6 lbs. (1.4 N) of force at the top of the handle moves the control lever. The friction collar is self-lubricating and does not require added lubrication.

Brake Adjustment

The brake band, located on the left side of the transmission, brakes the transmission and, in turn, brakes the rear wheels. As the brake pedal is depressed, linkage returns the transmission to neutral, dynamically braking the tractor. The brake band is actuated after the transmission reaches neutral, providing additional braking action. The brake band also serves as the parking brake.

To adjust the brake on C-Series automatic tractors, follow the preceding procedure outlined under "8-Speed Models." See Fig. 5-13.

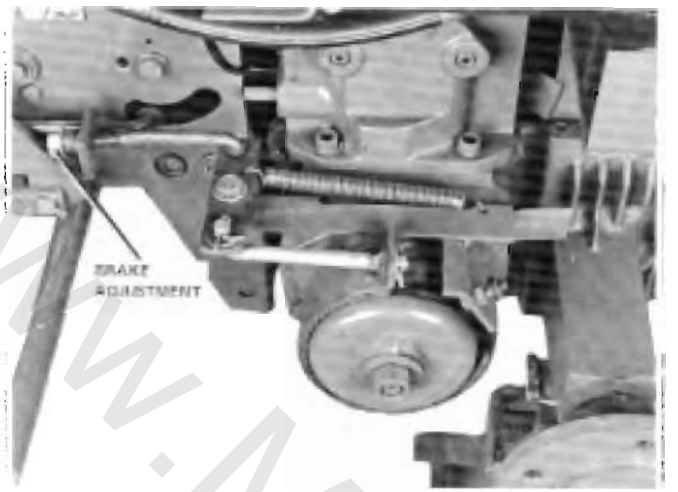


Fig. 5-13 C-Series Automatic Brake Adjustment

Remove and Replace Motion Control Linkage

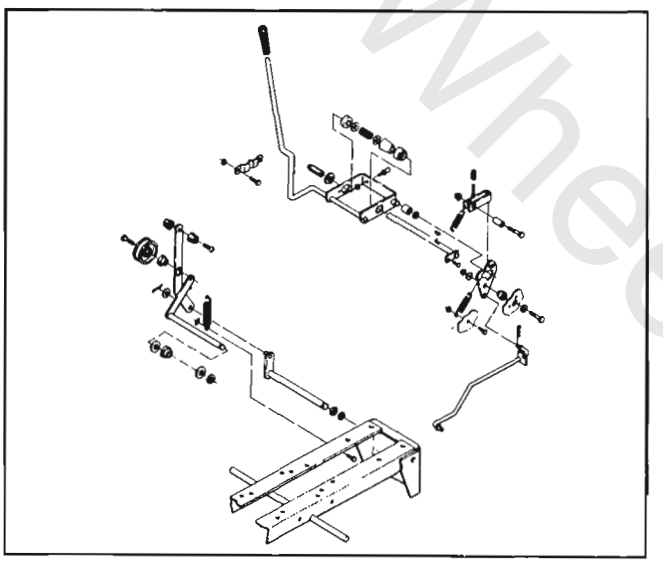


Fig. 5-14 C-Series Motion Control Linkage

1. Remove controls cover plate and left side cover.
2. Remove parking brake lever assembly. Remove nut holding pin to rear of motion control lever assembly. See Fig. 5-14.
3. Remove bolt from motion control shaft retaining tab.
4. Release pressure on motion control tension spring.
5. Pull shaft out far enough to expose woodruff key on left side of shaft. Remove key.
6. Pull shaft all the way out.
7. Carefully remove motion control handle assembly from under gas line and electrical harness.

Transmission/Transaxle — Automatic Models

For complete repair operations, refer to Wheel Horse Automatic Transmission Repair Manual No. A-1391.

Remove and Replace Transaxle

1. Drain the transaxle oil.
2. Remove knob from drive clutch handle and remove control cover plate.
3. Disengage transmission drive clutch and slip belt off drive pulley.
4. Remove seat hinge brackets and seat.
5. Unbolt seat pan and disconnect seat switch wires and tail light wires (if applicable).
6. Remove seat pan.
7. Remove two (2) bolts holding seat pan support bracket to top of transaxle. Remove fuel line clamp and conduit clamp (Ref. 8-Speed, Fig. 5-8).
8. Close fuel valve and disconnect gas line at tank.

> Secure fuel line to steering wheel to prevent fuel line from draining.

9. Remove two (2) bolts and nuts holding seat pan support bracket (Ref. 8-Speed, Fig. 5-8).
10. Lift off fuel tank along with both brackets and set tank aside.
11. Remove nut holding pin to rear of motion control lever assembly. See Fig. 5-14.
12. Remove left side panel.
13. Remove brake rod adjusting nut. (Ref. Fig. 5-13).
14. Models with hydraulic lift: disconnect two hydraulic lines at pump and mark for replacement (Ref. Fig. 5-8).
15. Support frame of tractor and remove 4 bolts holding transaxle to frame (Ref. 8-Speed, Fig. 5-9).
16. Remove transaxle assembly.

To replace transaxle, reverse above procedure. Refill with oil. Adjust brake band.

Remove and Replace Input Pulley

1. Remove right rear wheel.
2. Disengage drive clutch and slip belt off drive pulley.
3. Remove hex bolt on shaft and pull pulley.

Remove and Replace Pump/Motor

1. Complete steps 1 through 12 under Transaxle Remove and Replace.
2. Remove left rear wheel for clearance.
3. Complete steps 13 and 14 under Transaxle Remove and Replace.
4. Remove two transaxle case bolts holding top of drive motor and two lower bolts holding bottom of drive motor to transaxle.
5. Remove pump and motor as an assembly.

> Whenever pump/motor are removed from transaxle, always clean strainer and replace oil filter.

To replace pump/motor, reverse above procedure. Refill with oil. Adjust brake band.

Push Valve Function

Because of the "dynamic brake" feature of the hydrostatic transmission, the tractor can be pushed for only a few feet before the rear wheels will lock. If the tractor must be pushed, the manual bypass Push Valve must be opened. The valve is located inboard of the left rear wheel on C-Series tractors. To operate the valve, follow the instructions on the "push valve" decal. The valve has a square head and can be opened or closed with a wrench. Be sure to close the valve before operating the tractor.

Fig. 5-15 C-Series Automatic, Push Valve

> Hand push tractor only. Do not tow. Towing can cause severe damage to the hydrostatic transmission.

Acceleration Valves

Acceleration valves are used in the hydraulic drive circuit to limit vehicle acceleration to a safe rate.

Two valves are used: a forward valve and a reverse valve. See Fig. 5-16.

> Although the acceleration valves look similar, they are not alike. The forward valve, located at the rear of the end cap housing, incorporates wider relief flats on the valve lands than does the reverse valve, located at the front of the end cap housing. The forward valve may be used in place of the reverse valve; however, under no circumstance should the reverse valve be substituted for the forward valve.

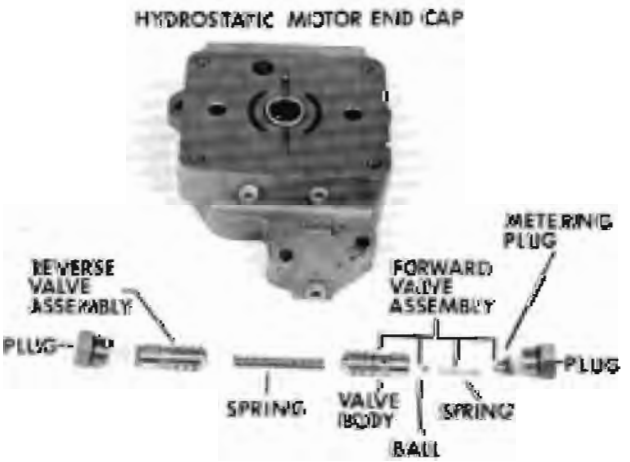


Fig. 5-16 C-Series Automatic Acceleration Valves

Implement Relief/Charge Valve

The implement relief valve is used to regulate hydraulic lift pressure. This valve limits pressure to maximum of 550 to 700 psi (38 to 50 kg/cm^2). It is located to the rear of the pump housing. The charge pressure relief valve is located to the front of the pump housing on models equipped with a hydraulic lift, and to the rear of the pump housing on models equipped with a manual lift. The charge pressure relief valve limits pump and motor circuit hydraulic pressure to 70 to 150 psi (4.9 to 10.5 kg/cm^2). See Fig. 5-17 and Fig. 5-18.

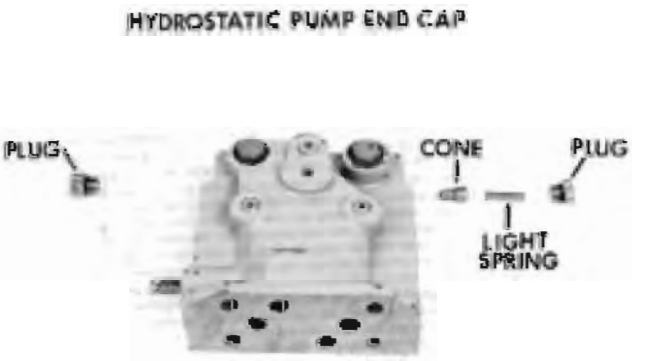


Fig. 5-17 C-Series Automatic Charge Pressure Valve (Manual Lift)

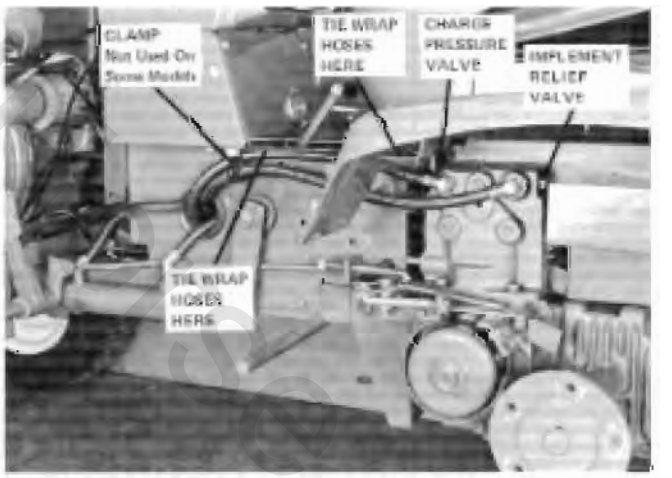


Fig. 5-18 C-Series Automatic Implement Relief/Charge Valves and Hydraulic Hose Routing (Hydraulic Lift)

Hydraulic Hose and Line Routing

Hydraulic line routing is shown in Fig. 5-18. Connections are shown in Fig. 5-19.

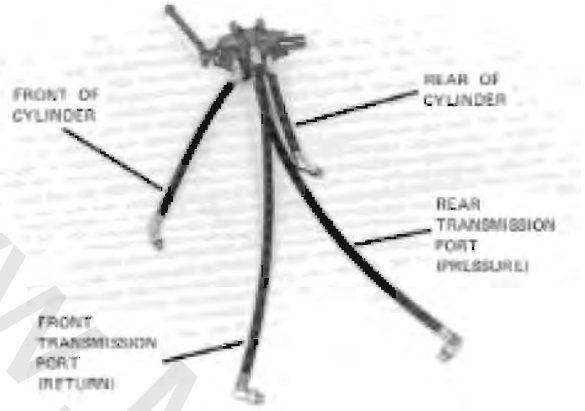


Fig. 5-19 C-Series Automatic Hydraulic Hose Connections

Hydraulic Flushing Instructions

To flush foreign matter from lines, use kerosene or equivalent solvent.

To flush hydraulic lift valve, allow solvent to flow through it.

To flush pump and motor, it is necessary to disassemble and overhaul.

To flush implement cylinder, blow all oil out by pushing cylinder rod in and out. Flush with solvent.

D-SERIES

Drive Line

The D-Series utilizes a flex coupling directly connecting the engine and the hydraulic pump. Oil is directed through a hydraulic manifold connecting the pump to a hydraulic motor.

Brake/Motion Control Linkage

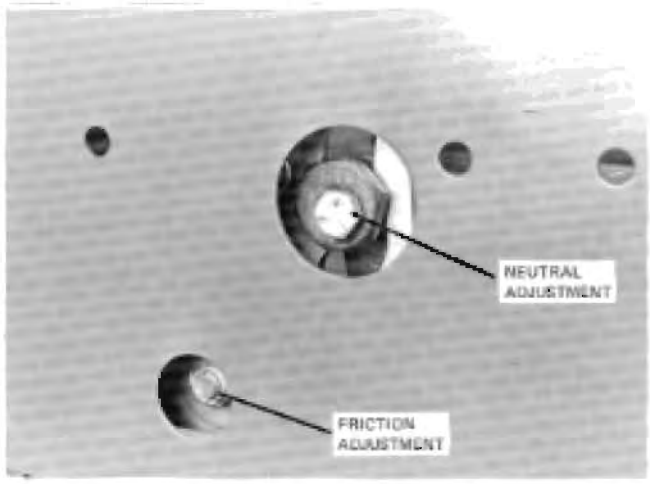


Fig. 5-20 D-Series, Friction and Neutral Adjustment

Motion Control Linkage Neutral Adjustment

Place the tractor on a level surface with engine running. Depress the brake pedal and release. The tractor should not creep and the rear wheels should be effectively locked.

An access hole is provided in the right console panel for the neutral adjustment.

If the tractor creeps when in neutral, adjust as follows:

1. Block the rear wheels off the ground.
2. Loosen the cap screw holding the eccentric assembly. See Fig. 5-20.
3. Start the engine and run at half throttle. Allow drive train to reach normal operating temperature.
4. Depress the brake pedal and release.
5. Rotate the eccentric until the rear wheels stop. (This usually occurs at a point midway between forward and backward wheel rotation.)
6. Retighten the cap screw while holding the eccentric assembly from turning.
7. Increase engine speed to full throttle.
8. Move speed control lever in both directions and return it to neutral with the pedal. (Repeat several times and re-adjust if necessary.)

> If the brake band is severely out of adjustment (too tight), proper neutral adjustment will not be possible due to restricted brake pedal travel. Loosen brake band adjustment nut completely, make the neutral adjustment, then adjust the brake band.

Detent Alignment Adjustment

After motion control has been adjusted for neutral, adjust the trunnion on the upper end of the control rod until the control handle is in the neutral slot on the side panel. See Fig. 5-21.

Motion Control Friction Adjustment

The motion control lever is friction-loaded to hold a selected speed in either direction. If the lever does not remain where it is set during operation, the friction may be increased by tightening the adjusting nut through the access hole located in the right panel. See Fig. 5-20.

> The proper amount of friction is obtained when approximately 16 to 20 lb. (3.6 to 4.5 N) of force at the handle moves the control lever.

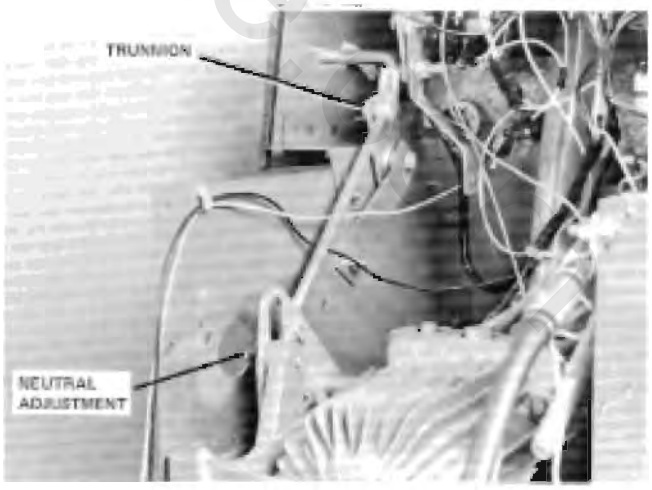


Fig. 5-21 D-Series, Motion Control Detent Adjustment

Brake Adjustment

The brake band, located on the left side of the transmission, brakes the transmission and, in turn, brakes the rear wheels. As the brake pedal is depressed, linkage returns the transmission to neutral, dynamically braking the tractor. The brake band is actuated after the transmission reaches neutral, providing additional braking action. The brake band also serves as the parking brake.

Fig. 5-22 D-Series, Brake Band Adjustment (front)

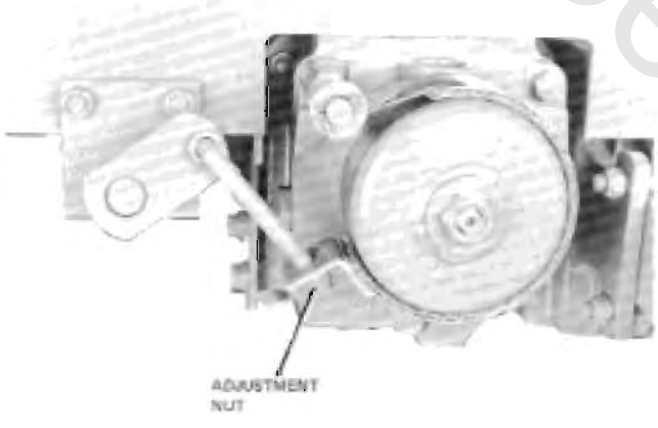


Fig. 5-23 D-Series, Brake Band Adjustment (rear)

Adjustment of the foot brake is as follows:

1. Release both foot and park brake.
2. Tighten the band adjustment nut until the brake band can no longer be slid from side to side on the brake drum.
3. Back off the nut until the brake band is again free to slide from side to side. See Fig. 5-23.
4. Front brake adjustment is only required if the linkage is removed. The jam nuts are adjusted so the spacer just contacts the spring, and the spring remains free to turn. See Fig. 5-22.

Parking Brake Adjustment

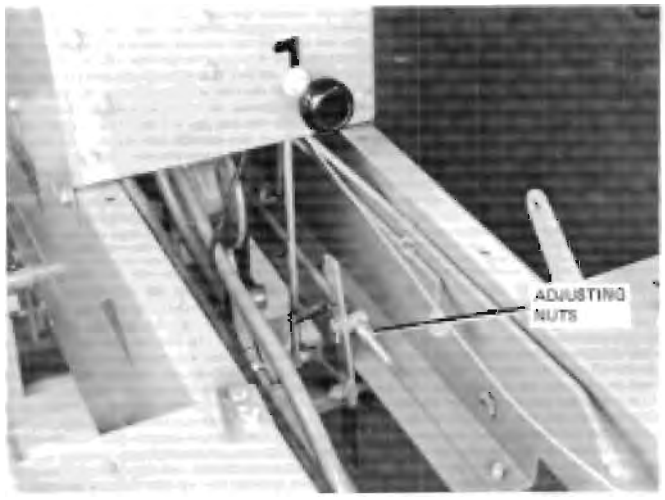


Fig. 5-24 D-Series Park Brake Adjustment

1. Depress brake pedal and pull up on park brake knob locking it in the notch.
2. Adjust nuts on rear rod to hold brake pedal fully depressed.
3. Depress brake pedal and move park brake knob to bottom of slot, making sure brake pedal releases.

> If adjustment is too tight, the knob rod will not latch in the slot.

Transaxle

For complete repair operations, refer to Wheel Horse Automatic Transmission Repair Manual No. A-1391.

Transaxle Removal

1. Drain the transaxle oil.
2. Block up the tractor with jack stands adjacent to the rear foot rest.
3. Remove both rear wheels.
4. Remove axle housing links, or dozer blade hitch if so equipped.
5. Remove brake rod from brake band (Ref. Fig. 5-23).

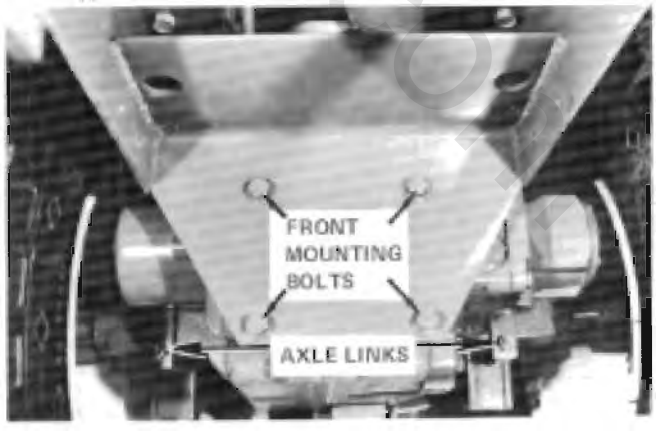


Fig. 5-25 Transaxle Assembly

6. Remove two 1/2 inch and two 3/8 inch cap screws that retain the hydraulic manifold to the hydrostatic motor.
7. Tie up the rear of the manifold so it is held clear of the motor pad.

Fig. 5-26 Hydraulic Manifold

8. Remove dipstick and tube assembly from transaxle and install a 1/2 inch pipe plug to keep out dirt.
9. Place a floor jack under transaxle assembly to support it for remaining bolt removal.
10. Remove four front butt plate-to-case bolts.
11. Remove four top frame plate to transaxle bolts.

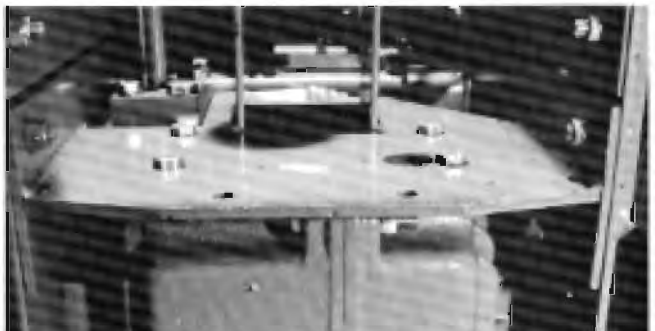


Fig. 5-27 Transaxle Top Bolts

12. Lower the transaxle, keeping it aligned between the butt plate and the frame angles to prevent binding.

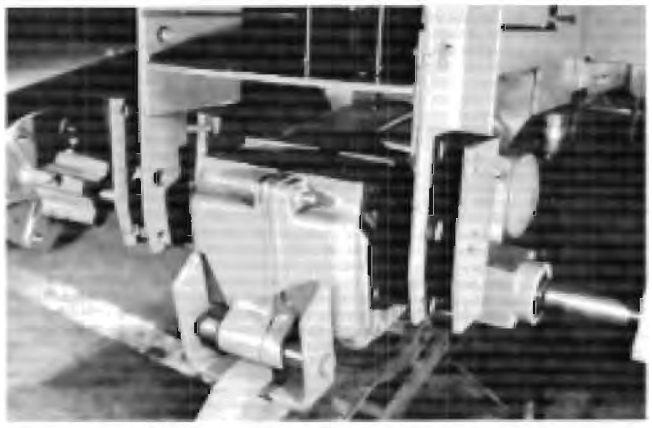


Fig. 5-28 Lowering Transaxle

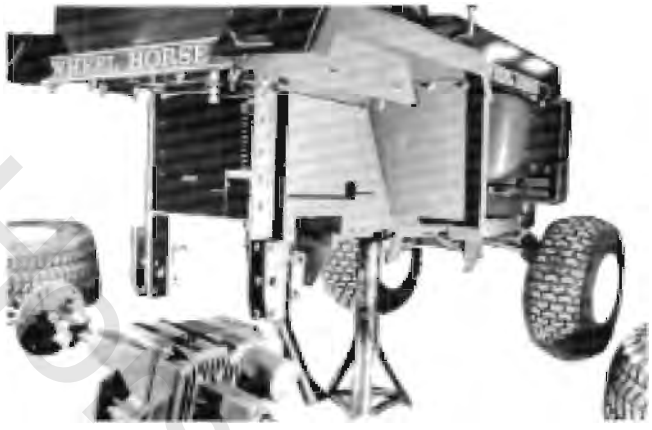


Fig. 5-29 Transaxle Removed

Transaxle Installation

1. Install new seal rings on the motor manifold mounting pad. The two large high pressure ports each require an "O" ring with a square section backup ring centered on top of each "O" ring.
2. Apply a small amount of grease in the recesses and on the rings to hold them in place.

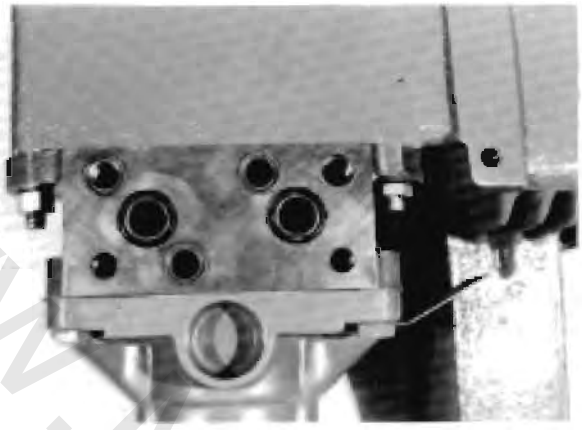


Fig. 5-30 "O" Ring Installation

3. To keep out dirt during installation, cover the motor manifold mounting pad and seals with a piece of cardboard and hold with a piece of wire.

> After transaxle installation, cut retaining wire and remove cardboard. Lift manifold to make sure seals are still in place.

Fig. 5-31 Mounting Pad Cover

4. Place transaxle squarely in the jack, and jack the unit up into place. Prevent binding between the front plate and the angle brackets.

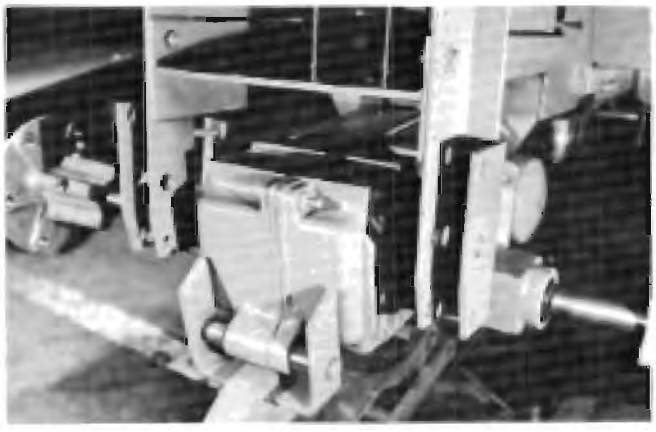


Fig. 5-32 Raising Transaxle

5. Start the top four case bolts using a punch for alignment. Leave them slightly loose at this time.

Fig. 5-33 Transaxle Top Bolts

6. Align the front case holes with the butt plate using a punch.
7. Install the four front bolts and washers, making sure the transaxle is squarely against both plates.
8. Tighten all eight bolts.
9. Install the axle links or hitch as applicable.
10. Connect the brake rod to the brake band.
11. Install the dipstick and tube assembly.

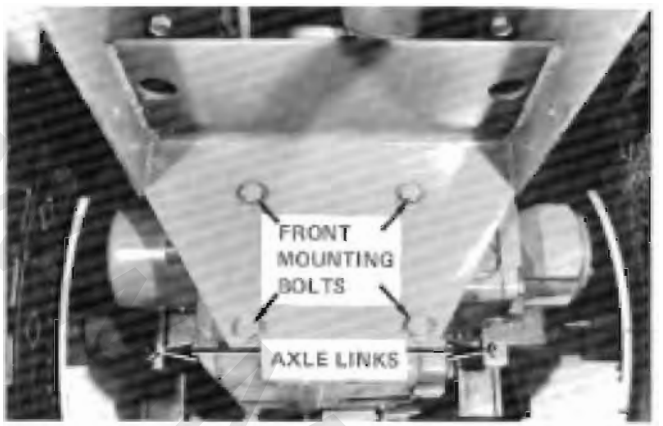


Fig. 5-34 Transaxle Front Bolts

12. Carefully align and lower the manifold pad in place and install the two 3/8 inch bolts and two 1/2 inch bolts.

> Make sure the special seal ring is used under the head of the front 1/2 inch bolt.

13. Tighten all four bolts evenly and securely.

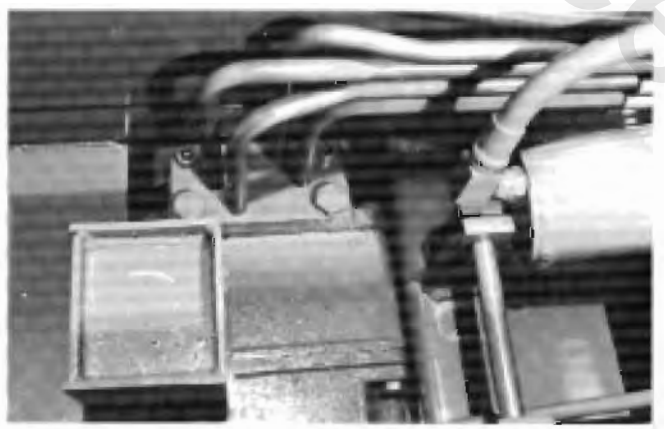


Fig. 5-35 Manifold Installation

14. Install both rear wheels.
15. Fill the transaxle with oil, start the engine, and check for any leaks and proper operation. Adjust brake band.

Pump Removal

1. To remove the hydrostatic pump, follow instructions in section 4 for engine removal. The engine may be moved forward on the frame for access to the pump, or removed from the frame, as desired.
2. Disconnect and remove the battery.
3. Remove the right console panel, together with the battery supports.
4. Disconnect all three control rods connected to the pump linkage.
5. Remove the four cap screws holding the front manifold pad to the pump pad. The two rear screws have elastic stop nuts on the top. An oil drain pan should be placed under this area, since there will be some oil loss.
6. Disconnect the hydraulic lift tubes located at the top of the pump.
7. Disconnect the temperature sending unit wire.
8. Remove the two 5/16 inch bolts and nuts that hold the rear pump bracket to the steering gear support.
9. Remove the bolt that attaches the front pump bracket to the left side panel.
10. Remove the pump and brackets.

> If a new pump is to be installed, carefully change the brackets and linkage from the old pump to the new pump.

Pump Installation

1. Place a small amount of clean grease in the manifold plate seal ring recesses and on the seal rings.
2. Place a small "O" ring in each of the low pressure port recesses and a large "O" ring in each of the large high pressure port recesses.
3. Place a square section type backup ring over the top of each of the large "O" rings, centering them.
4. To facilitate alignment of the pump to the manifold pad, fabricate two aligning pins. Cut the heads off two 3/8-16 x 2 bolts to make two studs. Saw a screwdriver slot and taper the ends as shown in Fig. 5-37.

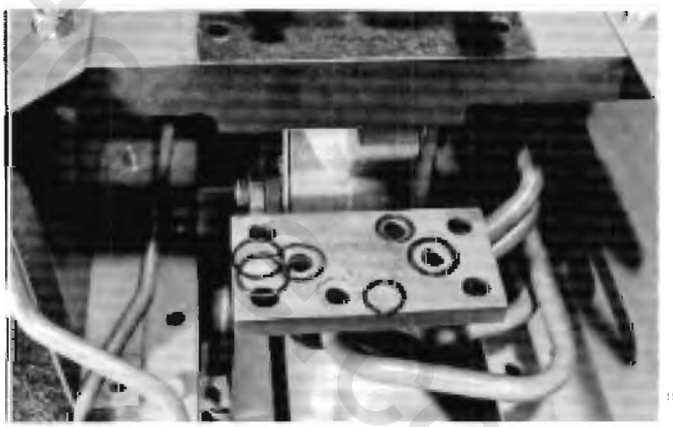


Fig. 5-36 "O" Ring Ports

5. Screw the aligning pins into the two front threaded holes in the pump pad.
6. Install the pump by placing it carefully in position.
7. Insert the aligning pins into the front manifold holes as the pump is lowered into place.

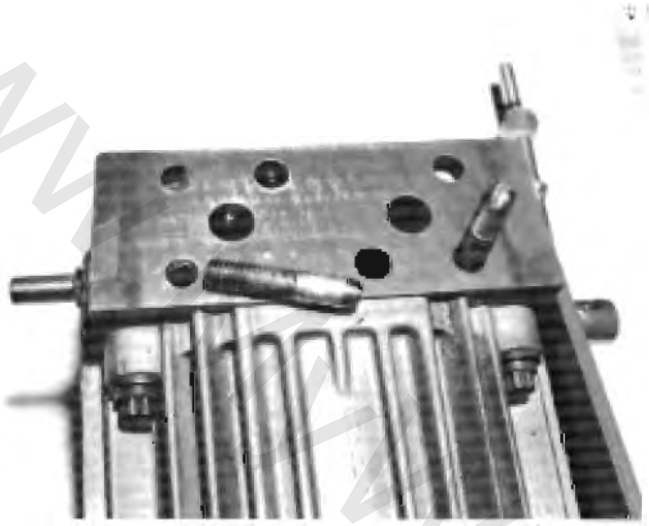


Fig. 5-37 Aligning Pins

8. Allow the pump bracket to rest on the steering gear brace. Install punches through the side panel holes and into the front bracket to hold the pump in position.
9. Install the two 5/16 inch bolts and nuts and secure the rear pump bracket to the steering gear brace.
10. Secure the left panel to the front bracket with the bolt and nut.
11. Connect the hydraulic tubes to the pump fittings.
12. Connect the temperature indicator wire to the sending unit.

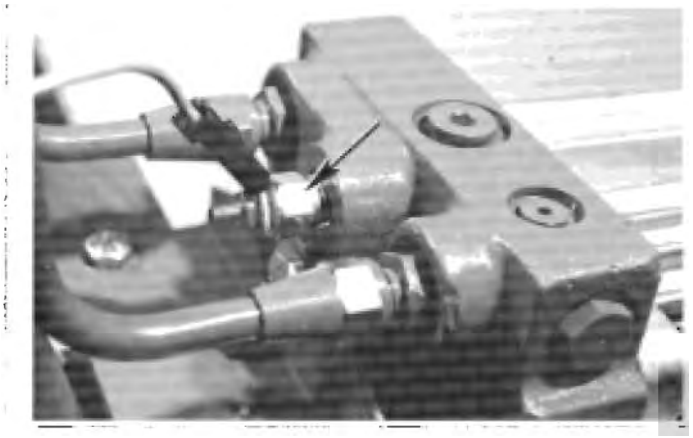


Fig. 5-38 Temperature Sending Unit

13. Install the two rear manifold-to-pump cap screws from underneath. Place the 3/8 inch elastic stop nuts on top, but do not tighten at this time.
14. Remove the two aligning studs and install the two front cap screws and tighten all four cap screws evenly.

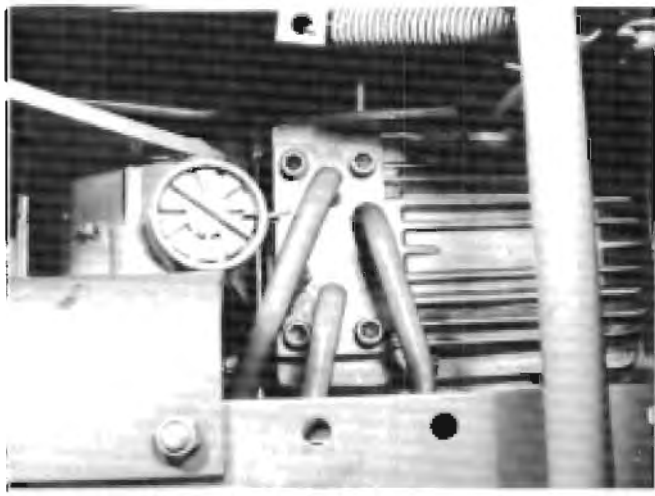


Fig. 5-39 Manifold Installed

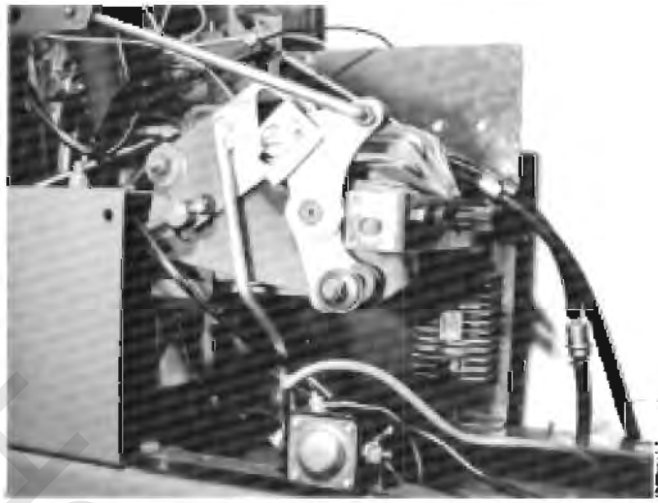


Fig. 5-40 Control Rod Connections

15. Connect the three control rods to their respective levers.
16. Install the right side panel and battery supports.

Fig. 5-41 Side Panel Installation

17. Lubricate the pump spline and splined washer with "moly" grease and slide the engine carefully to the rear.
18. Engage the pump spline with the pump coupling; center the engine on the pump shaft.

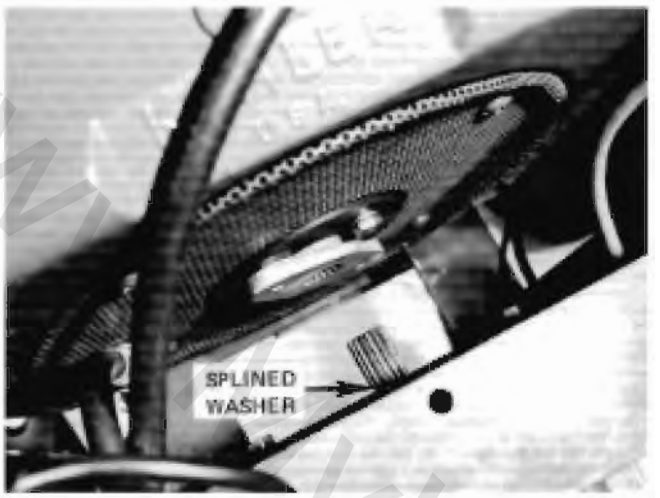


Fig. 5-42 Pump Spline Engagement

19. Bolt the engine securely to the frame.
20. Connect engine controls as required.
21. Install and connect the battery.
22. Install the grille shroud and hood.
23. Test the unit for proper operation.
24. Check the oil level, filling as required.

> If neutral and tension adjustments were moved, they will require readjustment.

Motor Removal

1. Jack the tractor up under the frame and remove the left rear wheel.
2. Place an oil drain pan under the motor and transaxle to catch oil as the motor is removed.
3. Remove the four cap screws that hold the manifold pad to the motor (Ref. Fig. 5-46).
4. Tie up the manifold so it will clear the motor pad.
5. Disconnect brake rod from brake band.
6. Remove the nuts from the two bolts securing the top section of the motor to the transaxle (Ref. Fig. 5-44).
7. Remove the two lower motor-to-case cap screws which thread into the case. (Ref. Fig. 5-43).
8. Remove the motor.

Motor Installation

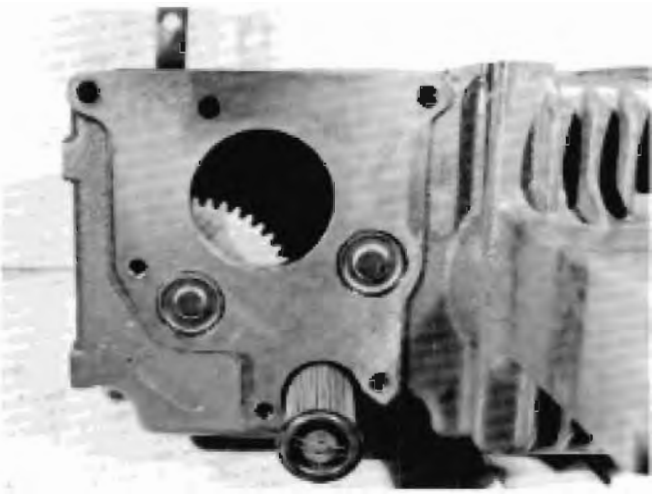


Fig. 5-43 Motor Mounting Area

Fig. 5-43 shows the motor mounting area with the intake screen pulled out. The two cap screw holes on each side of the screen and the two top corner holes are for the four bolts which retain the motor to the case.

1. Apply a small amount of grease to the motor manifold pad recesses and the "O" rings to hold them in place.
2. Install two small "O" rings in the two low pressure ports.
3. Install a third small "O" ring around the right front bolt hole, located at the top left corner of the manifold pad.
4. Center a square section backup ring on top of each of the large "O" rings and install them in the two large high pressure ports.

> When properly installed, the bottom of the backup rings will be just below the top of the recess. Be careful not to get dirt on the pad surface.

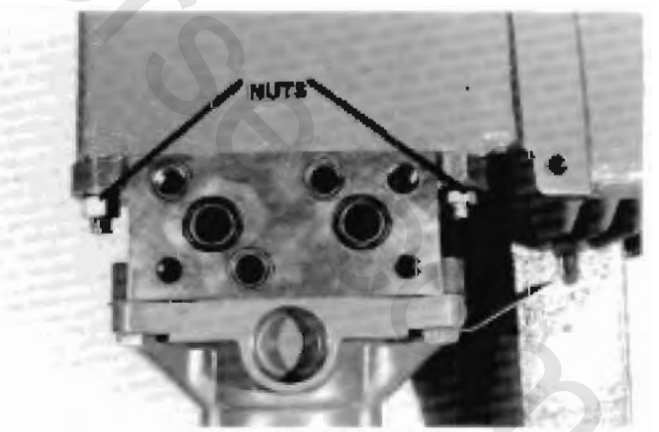


Fig. 5-44 "O" Ring Installation

5. Install a new gasket on the transaxle.
6. Line the motor up on the two top case bolts and install the nuts. Install the two lower cap screws.

Fig. 5-45 Motor Installation

7. After the motor has been secured to the transaxle, check the seal rings to make sure they are in position.
8. Release the back of the manifold if it was tied up during the motor removal.
9. Line up the manifold and install the four (4) bolts. Make sure the special seal washer is under the head of the right front bolt.
10. Connect brake rod to brake band.
11. Test the unit for proper operation.
12. Check the oil level, filling as required. Adjust the brake band.

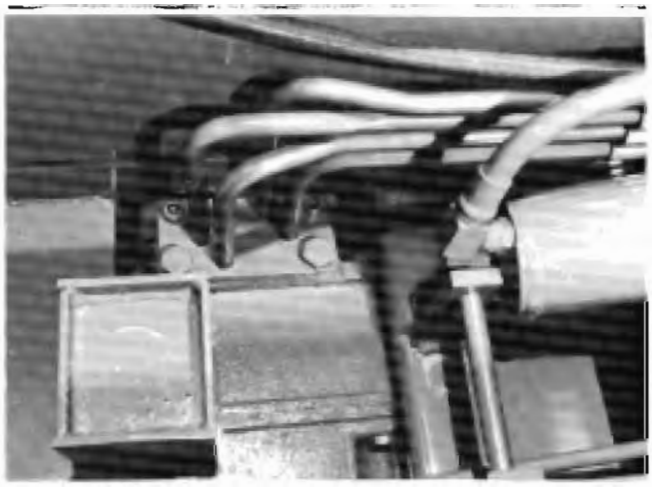


Fig. 5-46 Manifold Installed

Manifold Removal

1. Remove two 3/8 inch allen head screws and two 1/2 inch cap screws holding the manifold pad to the motor.
2. Lift the manifold and remove the "O" rings.
3. Remove the two cap screws and two hex head bolts and nuts holding the manifold to the pump.
4. Remove these "O" rings being careful to keep dirt away from the open oil ports.
5. Remove the manifold by turning it past the steering gear bracket and pulling it out towards rear of tractor.

> Cover all open oil ports in both motor and pump to keep loose dirt from entering.

Manifold Installation

Install new seal rings on the manifold pad as follows:

1. Place a small amount of grease in the seal ring recesses and on the seal rings.
2. Place a small "O" ring in each of the low pressure port recesses and a large "O" ring in each of the high pressure port recesses.
3. On top of each large "O" ring, place a square section type backup ring. Center it exactly on top of each of the "O" rings.

Fig. 5-47 "O" Ring Installation

4. Place a protective cardboard cover over the seal rings to hold them in place and keep the area free from dirt during installation.

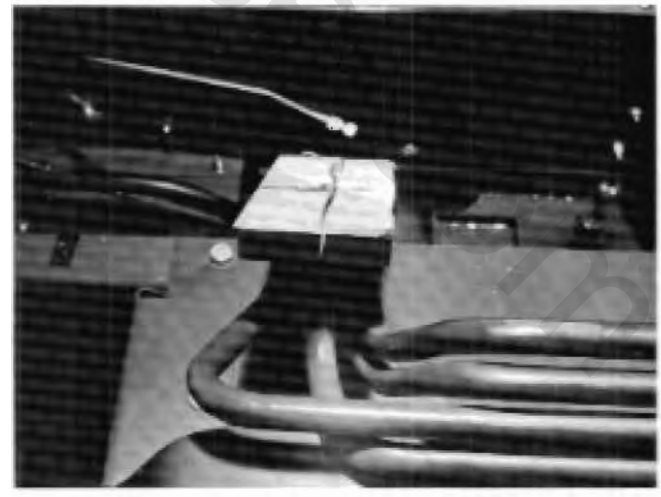


Fig. 5-48 Protected Seal Rings

Fig. 5-49 shows the location of the seal rings and manifold attaching bolts at the hydraulic motor pad.

Two 3/8 inch bolts and washers are used at the left side of the pad, and two 1/2 inch bolts at the right side. Also note that the rear 1/2 inch bolt does not use a washer. The front 1/2 inch bolt, however, requires a special seal washer. An "O" ring is used between the manifold and the motor pad at this location.

These extra seals are required since this bolt goes down into a pressure area. If it is not sealed, there will be a major oil leak.

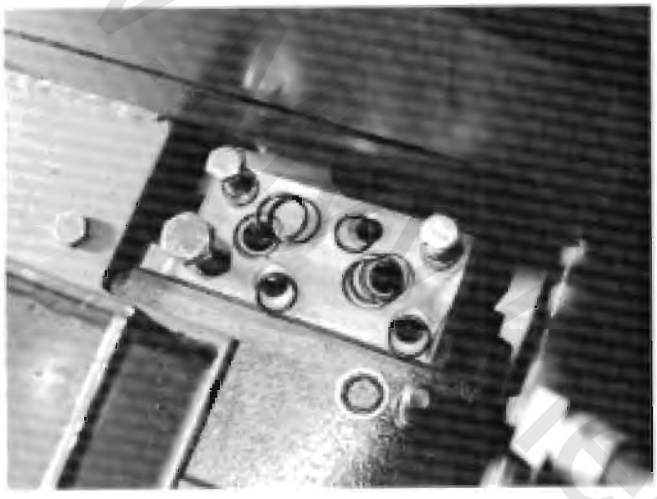


Fig. 5-49 Ring and Bolt Locations

Before installing the manifold, examine it carefully for cracks around the tubing welds. Make sure the clamps prevent the tubes from flexing. If the tubes can be moved in a clamp, remove the clamps and shape them as required to hold the tubes firmly. Fig. 5-50 shows the front of the manifold as it is inserted past the steering gear bracket and turned to position it for attachment to the pump pad. Leave the protective cover on this pad while the rear of the manifold is being connected to the hydraulic motor.

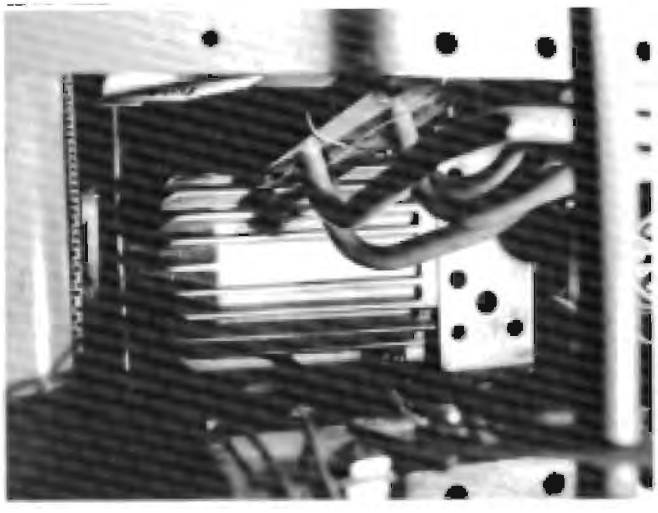


Fig. 5-50 Positioning Front of Manifold

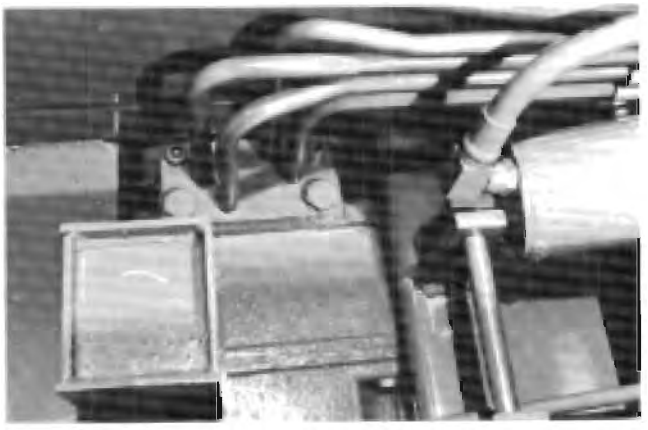


Fig. 5-51 Rear Manifold Pad in Place

5. Carefully hold the manifold in place.
6. Align the bolt holes in the rear manifold pad with the bolt holes in the motor and install all four bolts.

Make sure special seal washer is under head of right front 1/2 inch bolt. Do not completely tighten the bolts at this time.

7. Remove the protective cover from the front manifold pad and check to make sure all seal rings are in place. This is done by flexing the tubes down just enough to feel if all the "O" rings and backup rings are in place.
8. Position the manifold pad so the bolt holes line up.
9. Install the two short front hex screws. Leave them loose at this time.
10. Install the two longer bolts in the two rear holes, with the elastic stop nuts on top.
11. Tighten all four bolts evenly, holding the nuts on the rear bolts as required.
12. Tighten all four of the rear manifold pad-to-motor bolts.

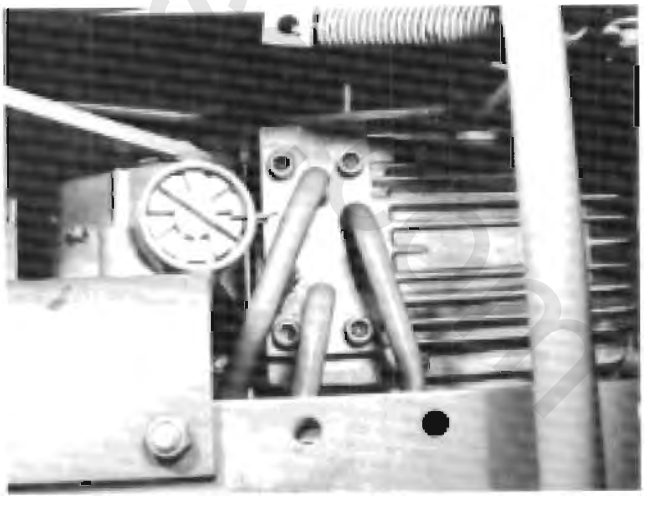


Fig. 5-52 Front Manifold Pad Installed

Push Valve Function

Because of the "dynamic brake" feature of the hydrostatic transmission, the tractor can be pushed for only a few feet before the rear wheels will lock. If the tractor must be pushed, the manual bypass Push Valve must be opened. The valve is located on the left side of the tractor above the footrest. To operate the valve, follow the instructions on the "push valve" decal. The valve has a square head and can be opened or closed with a socket wrench. Be sure to close the valve before operating the tractor. See Fig. 5-53.

Fig. 5-53 D-Series Push Valve

> Hand push tractor only. Do not tow. Towing can cause severe damage to the hydrostatic transmission.

Acceleration Valves

Acceleration valves are used in the hydraulic drive circuit to limit vehicle acceleration to a safe rate.

Two valves are used: a forward valve and a reverse valve. See Fig. 5-54.

> Although the acceleration valves look similar, they are not alike. The forward valve, located at the rear of the end cap housing, incorporates wider relief flats on the valve lands than does the reverse valve, located at the front of the end cap housing. The forward valve may be used in place of the reverse valve; however, under no circumstances should the reverse valve be substituted for the forward valve.

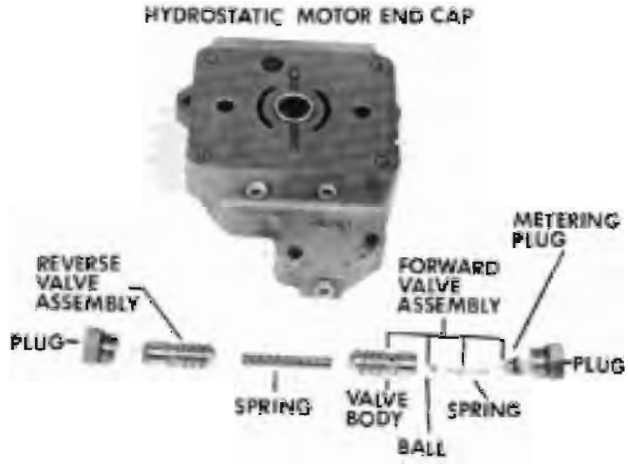


Fig. 5-54 Acceleration Valves

Implement Relief Valve

The implement relief valve is used to regulate hydraulic lift pressure. This valve limits pressure to a maximum of 550 to 700 psi (38 to 50 kg/cm^2). The valve is located to the rear of the pump on the right side. See Fig. 5-55. The charge pressure relief valve is located on the left, and limits pump and motor circuit hydraulic pressure to 70 to 150 psi (4.9 to 10.5 kg/cm^2).

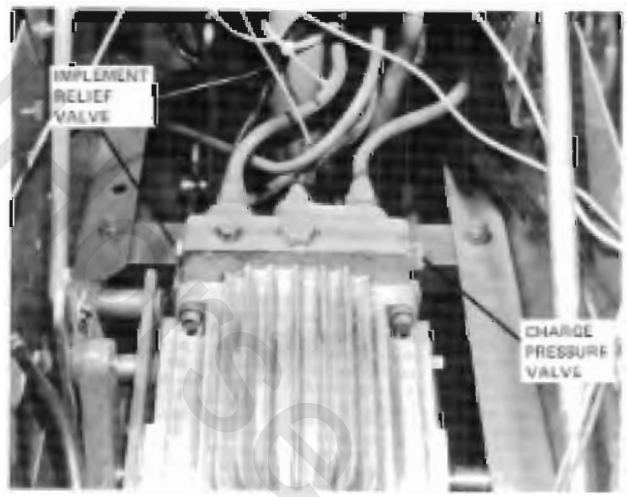


Fig. 5-55 D-Series Charge and Implement Relief Valves

Hydraulic Hose and Line Routing

Routing of hydraulic lines is illustrated in Fig. 5-56.

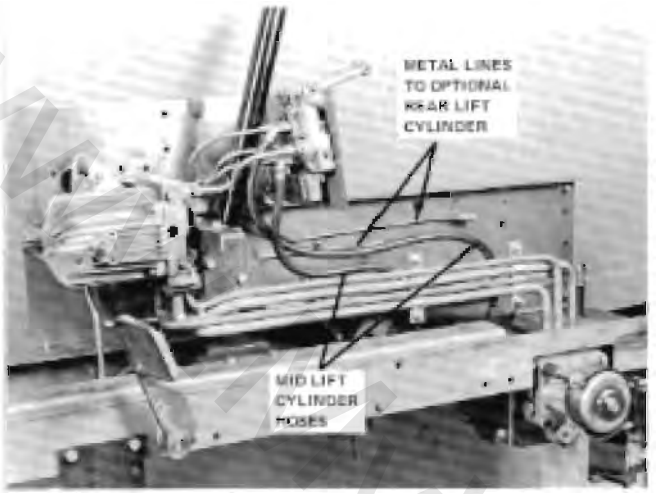


Fig. 5-56 D-Series Hydraulic Lines Routing

Fig. 5-56 D-Series Hydraulic Lines Routing

Hydraulic Flushing Instructions

To flush foreign matter from lines, use kerosene or equivalent solvent.

To flush hydraulic lift valve and manifold, allow solvent to flow through it.

To flush pump and motor, it is necessary to disassemble and overhaul.

To flush implement cylinder, blow all oil out by pushing cylinder rod in and out. Flush with solvent.

C-161 TWIN

Same as C-Series

NOTES

ELECTRICAL SYSTEM

B-SERIES

Ignition System

Magneto ignition is used in the B-Series. The ignition switch is used to ground the magneto to stop the engine, and to engage the starter.

The ignition switch continuity test is performed as follows with the switch totally disconnected:

Position	Terminals
OFF	M & switch case
RUN	B & R & A
START	B & S

Continuity between these terminals in the positions shown indicates a good switch.

Do not interchange B-Series with C and D-Series ignition switches even though they look identical.

Charging System

The B-Series is equipped with a dual circuit alternator. One circuit provides 12 volts AC (alternating current) to power the lights. The lights will NOT operate without the engine running (lights optional on B-81).

The second circuit provides charging current (12 volts DC) to the battery.

Never interconnect the AC light circuit and the DC battery circuit as charging system may be seriously damaged.

The DC output for charging the battery is obtained through use of a diode. If the battery does not recharge, check the diode. The diode is contained in a fuse capsule near the starter.

If the engine must be operated with the battery disconnected from the charging system, always disconnect the DC output lead at the fuse capsule, to avoid possible charging system damage.

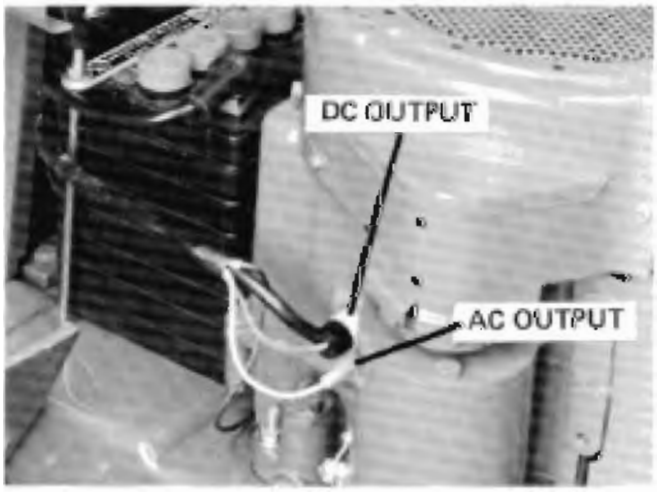


Fig. 6-1 B-Series DC Output Diode and AC Output Lead

The alternator charging system normally requires no service other than periodically checking that all exposed wiring and electrical connections on the tractor are clean, tight, and in good condition.

Proper polarity is critical with an alternator equipped charging system. Always disconnect the battery ground cable (negative) before working on any part of the electrical system. Verify all components are connected correctly before reconnecting the ground cable (negative).

Interlock Switches

The B-Series interlock system incorporates two switches, one operated by the foot pedal, and one operated by the PTO clutch lever. If the starter fails to operate, check the position of the switches in relation to their respective operating levers. Be sure the switches are actuated when the PTO clutch lever is in the disengaged position, and when the foot pedal is depressed. Both interlock switches must be closed to start the engine.

Fig. 6-2 B-Series PTO Interlock Switch

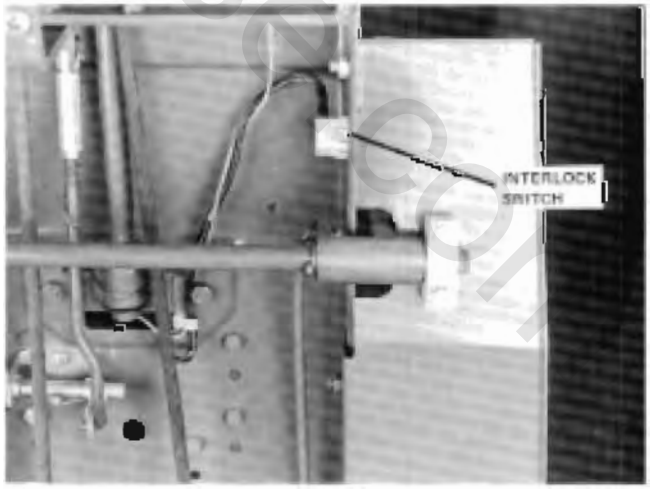


Fig. 6-3 B-Series Foot Pedal Interlock Switch

The PTO interlock switch is located to the side of the PTO lever. To remove or replace this switch, first remove the battery, turn the steering full left, disconnect the connector, and remove the switch nut. See Fig. 6-2.

The foot pedal interlock switch is located to the side of the foot pedal. It is the refrigerator type and presses out from inside the frame. See Fig. 6-3.

Lighting Circuit

The B-Series incorporates an alternator (12V AC) system for lighting only (lights optional on B-81).

A special spring clip washer is used on the hood axle rod to assure hood electrical ground contact for the headlights. See Fig. 6-4.

Fig. 6-4 B-Series Hood Spring Clip

Wiring Harness

Harness routing for the B-Series is shown in Fig. 6-5. Refer to B-Series electrical circuit diagram for connections when servicing or replacing the entire harness. See Fig. 6-6.

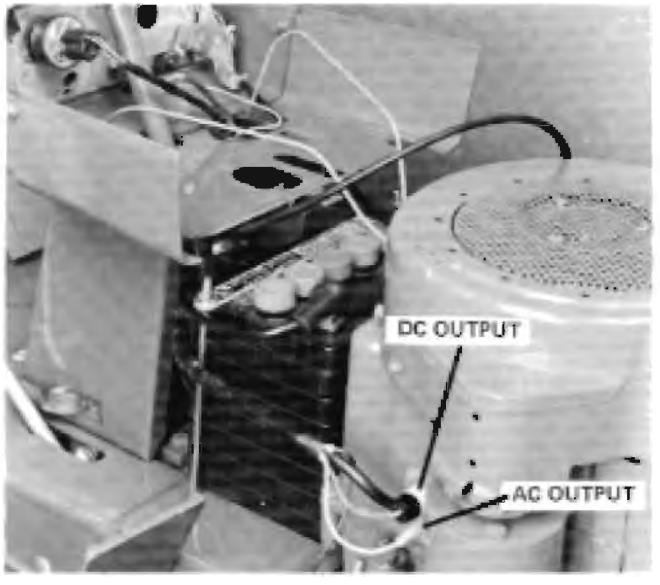


Fig. 6-5 B-Series Wiring Harness

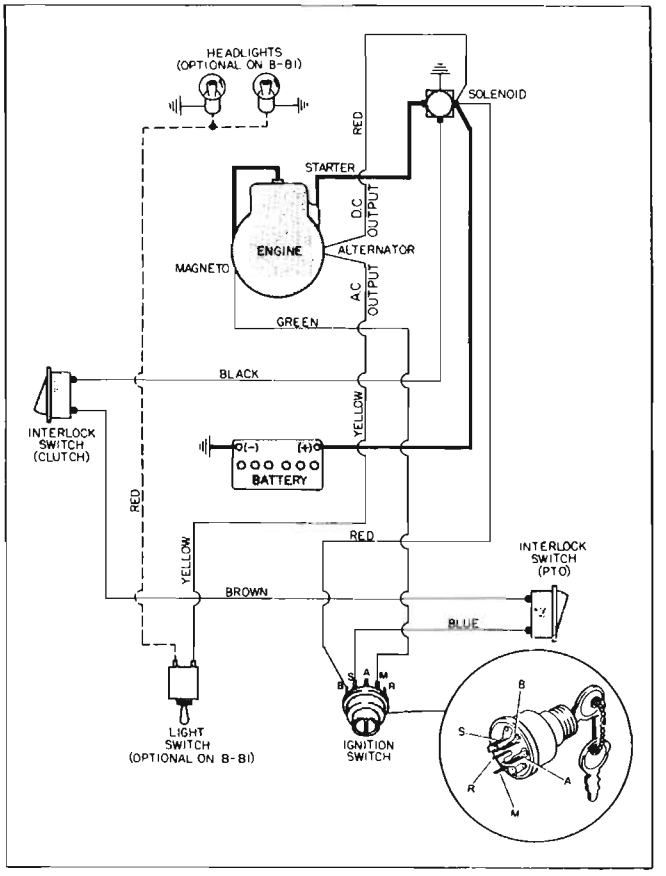


Fig. 6-6 B-Series Wiring Diagram

C-SERIES

Ignition System

Battery and coil ignition is used in the C-Series.

The ignition switch continuity test is performed as follows with the switch totally disconnected:

Position	Terminals
OFF	no continuity
RUN	B & R & I & A
START	B & S & I

Continuity between these terminals in the positions shown indicates a good switch.

Do not interchange C and D-Series ignition switch with B-Series even though they look identical.

Charging System

A 15 amp alternator system is used to supply electrical power to charge the battery. Battery power then operates coil ignition, cranking and electrical accessories. Regulation is provided by solid state rectifier/regulator. This "senses" the condition of the battery and controls and limits the charge rate. Since heat is generated, cooling fins are provided on the rectifier/regulator. It should be kept uncover-

ed and clean to allow proper ventilation when the tractor is in operation. The alternator charging system requires no service other than periodically checking that all exposed wiring and electrical connections on the tractor are clean, tight, and in good condition.

Disconnect the rectifier/regulator plug when charging the battery in the tractor or when using a booster battery to start the engine. The rectifier/regulator is located behind the engine, just below the battery.

> Proper polarity is critical with an alternator equipped charging system. Always disconnect the battery ground cable (negative) before working on any part of the electrical system. Verify all components are connected correctly before reconnecting the ground cable (negative) or damage to alternator system components will result.

> Never run the engine if the battery is removed, or if the battery is not connected to the charging system. Serious damage to charging system components may result.

Charging System Test

The overall charge system is tested by placing a DC voltmeter across the battery terminals with the engine running at full throttle. The reading should be 13.5 volts.

Ammeter Test

To test ammeter, turn ignition switch on and turn lights on. Ammeter should show discharge. If not equipped with lights, start the tractor and note initial ammeter reading, quickly dropping off to zero.

Interlock Switches

The C-Series safety interlock system incorporates two switches. One switch is actuated by the clutch pedal on 8-speed models and by the brake/return to neutral pedal on automatic models. See Fig. 6-7 and Fig. 6-8.

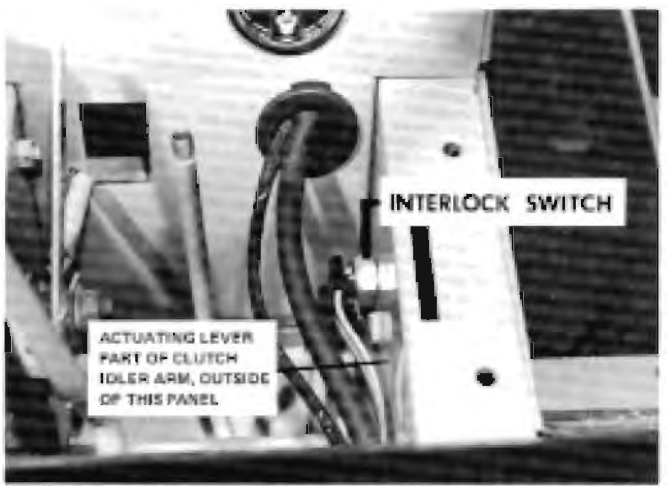


Fig. 6-7 C-Series Clutch Pedal Interlock Switch

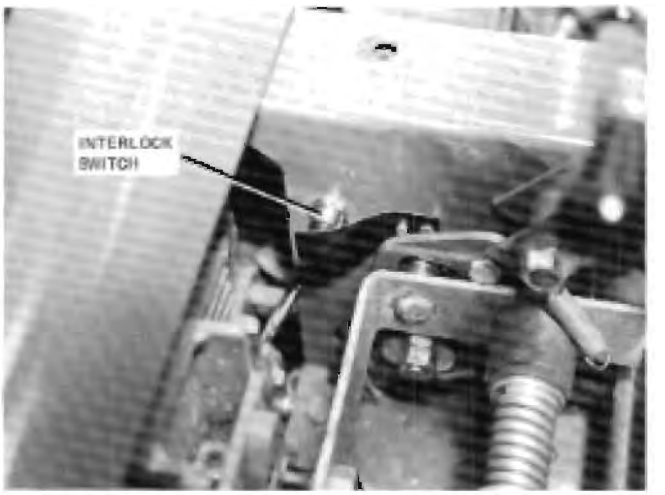


Fig. 6-8 C-Series Automatic Foot Pedal Interlock Switch

The other safety switch is actuated by the PTO clutch lever. If the starter fails to operate, check the position of the switches in relation to their respective operating levers. Be sure the switches are activated when the PTO clutch lever is in the disengaged position and when the foot pedal is depressed.

Both interlock switches must be closed in order to start the engine. Check the switches by testing for continuity. Check the PTO switch between the black wires, then across the red wires.

Interlock Switch Locations and Replacement

The foot pedal switch in both the 8-speed and the automatic models is located on the hood stand under the controls access panel. To remove or replace this switch on either model, remove the controls cover plate to expose the switch and remove side panel to remove switch nut.

The PTO switch in all C-Series is located to the right rear of the battery. To remove or replace this switch, disconnect the electrical connector, remove the battery, remove the large switch nut and pull switch out. See Fig. 6-9.

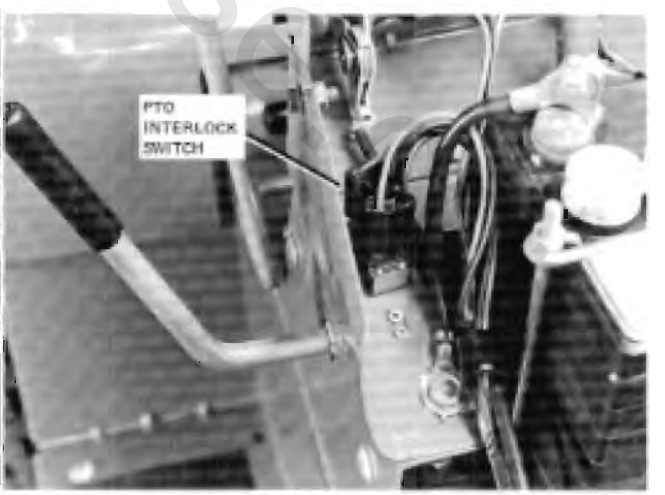


Fig. 6-9 C-Series PTO Interlock Switch

Seat Switch

A seat switch is incorporated on C-Series tractors. If the driver rises off his seat with the PTO engaged, the seat switch interrupts the ignition coil voltage and the engine stops. The seat switch has no effect on the tractor unless the PTO lever is engaged.

The engine can be started without the seat switch being depressed.

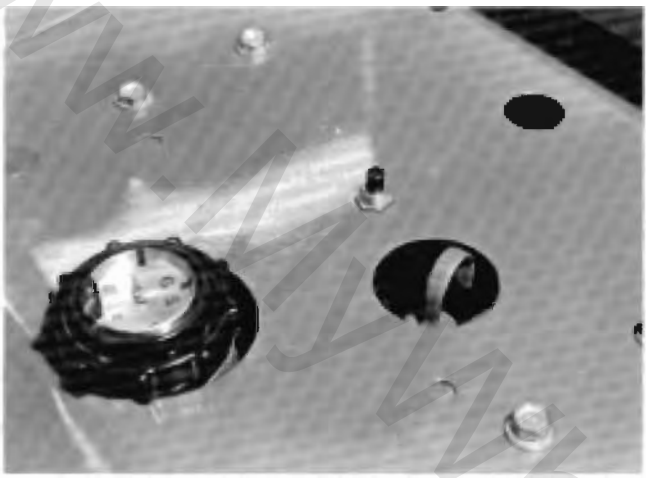


Fig. 6-10 C-Series Seat Switch

The seat switch is located under the seat in the seat pan. See Fig. 6-10. To replace the switch, remove the transaxle oil dip stick for finger access to the switch. Remove the nut from the top of the switch and pull the switch from the seat pan.

Lighting Circuit

The light circuit on C-Series tractors (optional on some models) is powered by the battery. The lights operate when the ignition switch is in the Run position. A 20 amp SFE fuse is part of the light circuit. The fuse is contained in a fuse capsule connected between the ignition switch and the light switch, behind the dash panel.

Wiring Harness

Harness routing for the C-Series is shown in Fig. 6-11a and Fig. 6-11b. Refer to C-Series electrical circuit diagram for connections when servicing or replacing the entire harness. See Fig. 6-13.

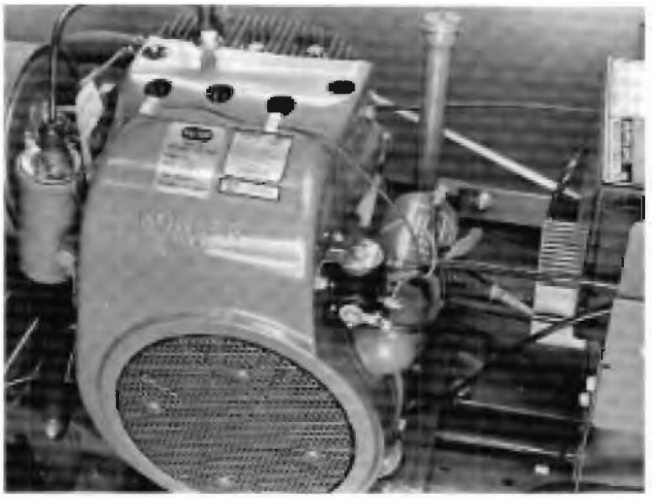


Fig. 6-11a C-Series Harness Routing (All but C-81)

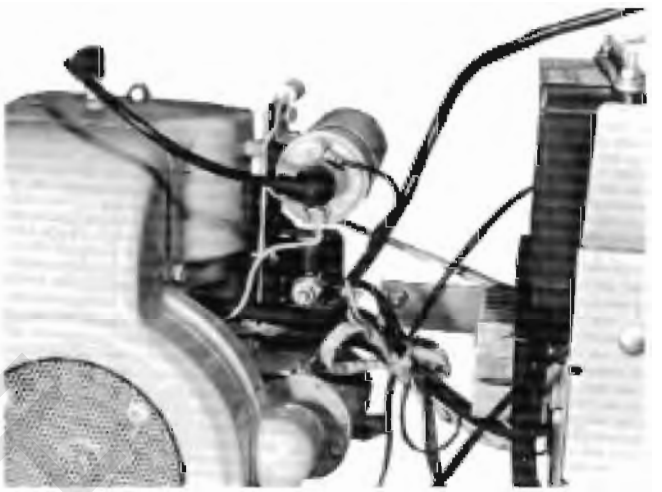


Fig. 6-11b C-Series Harness Routing (C-81 Only)

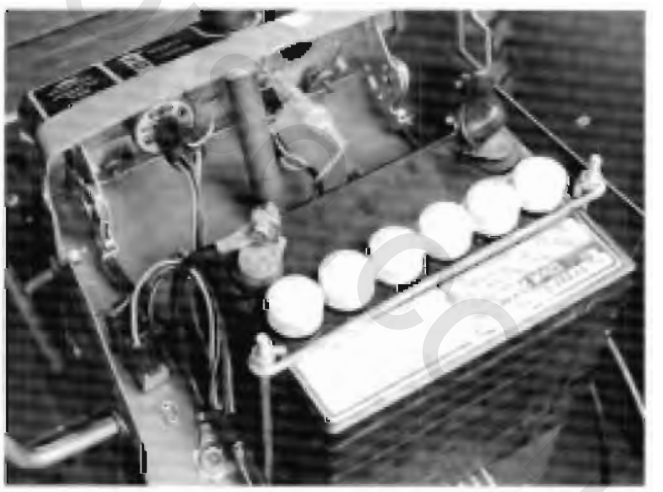


Fig. 6-12 C-Series Harness Routing

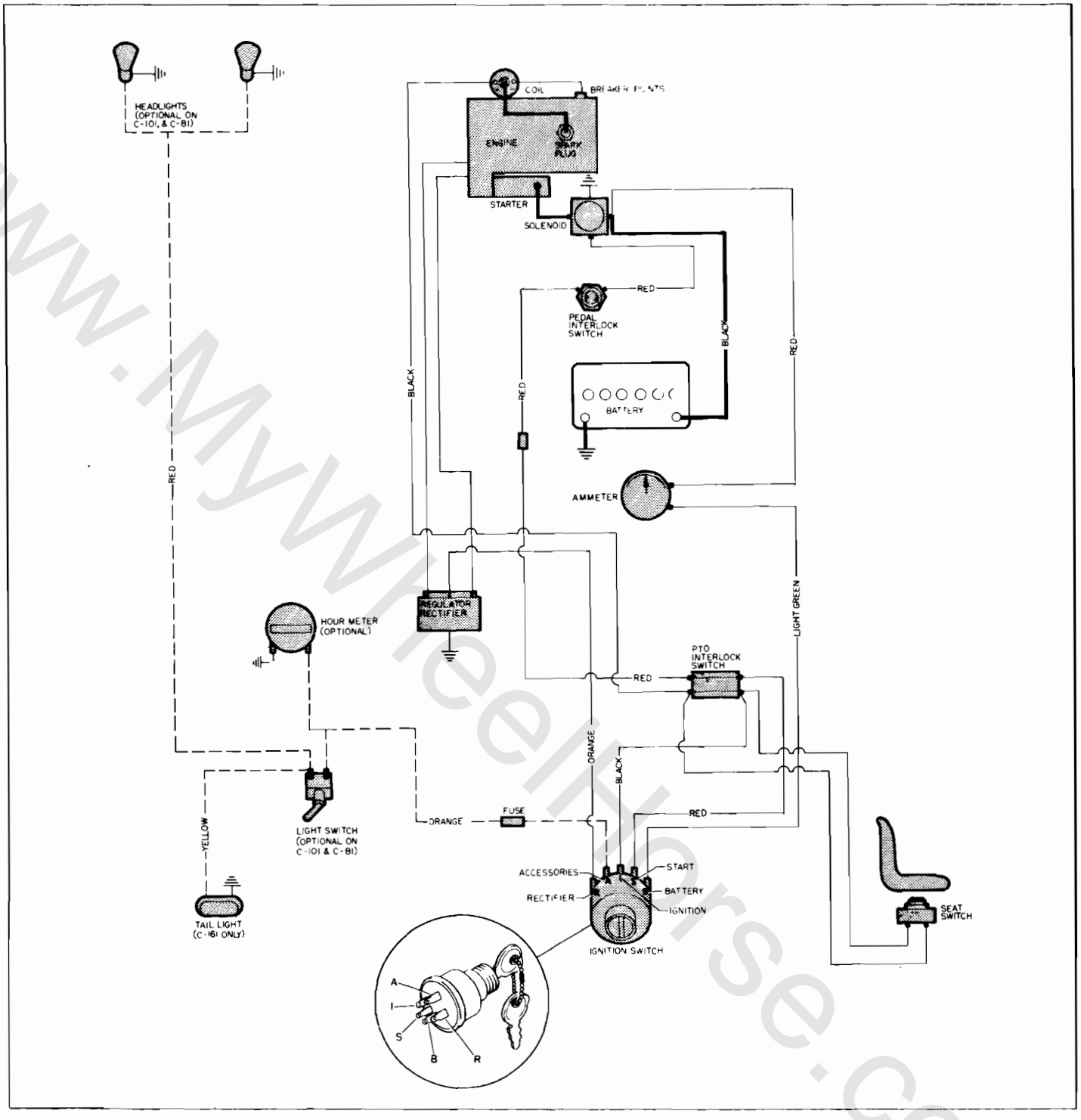


Fig. 6-13 C-Series Wiring Diagram

D-SERIES

Ignition System

The D-Series utilizes battery and coil ignition. Refer to C-Series for ignition switch testing procedure.

Charging System

Same as C-Series. The rectifier/regulator is located behind the engine below the battery, on the inside of the left side panel.

Charging System Test

Same as C-Series.

Ammeter Test

Same as C-Series.

Interlock Switches

The D-Series safety interlock system incorporates two switches. The two interlock switches are operated

by the brake/return to neutral pedal and the PTO clutch control. If the starter fails to operate, check the position of the switch in relation to its respective operating lever. The starter will not operate unless both switches are closed. The D-160 electric PTO switch and the D-200 mechanical PTO lever must be in the off and disengaged positions respectively. Check the switches for continuity. The PTO switch should have continuity between black wires and continuity between red wires.

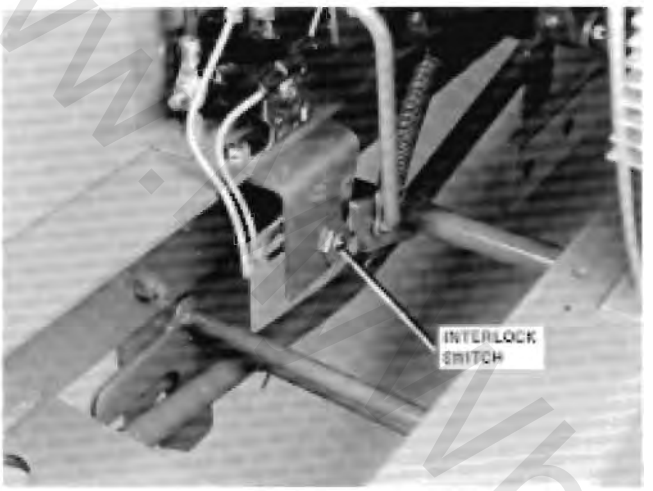


Fig. 6-14 D-Series Foot Pedal Interlock Switch

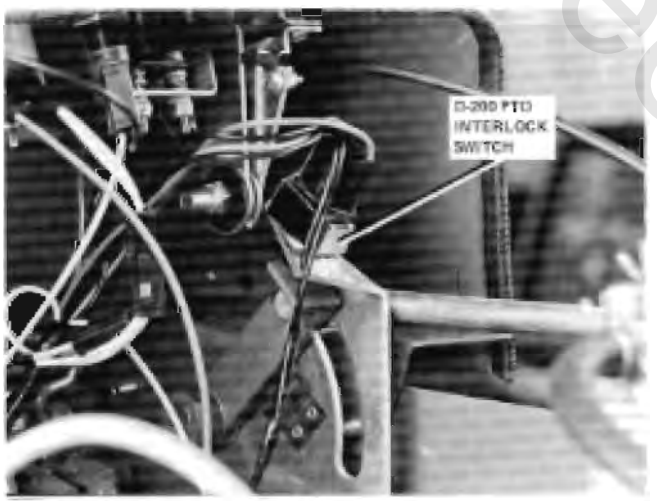


Fig. 6-15 D-200 PTO Interlock Switch

Interlock Switch Locations and Replacement

D-160

The PTO is interlocked through the PTO switch on the control panel. To replace, remove dash panel and change switch.

The foot pedal interlock switch is located beneath the solenoid by the right frame member. See Fig. 6-14. To replace the switch, remove the large nut from the switch, and release from the holding bracket, and disconnect wires.

D-200

The PTO interlock switch is located on the mechanical PTO handle bracket under the hood. To replace the switch, remove the battery and engage the PTO for access to the switch nut. See Fig. 6-15.

The D-200 foot pedal switch location and replacement is identical to the D-160.

Seat Switch

A seat switch is incorporated on the D-Series tractors. Its operation and purpose is same as C-Series.

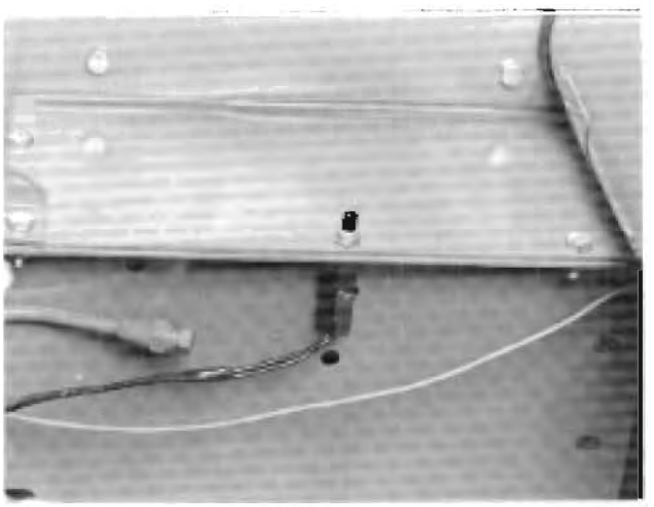


Fig. 6-16 D-Series Seat Switch

To replace the seat switch, raise the seat, remove the switch nut, and pull switch from frame. See Fig. 6-16.

Lighting Circuit

The light circuit on D-Series tractors is powered by the 12V battery. The lights operate when the ignition switch is in the Run position. A 20 amp SFE fuse is part of the light circuit. The fuse is contained in a fuse capsule connected between the ignition switch and the light switch, just below the edge of the instrument panel. See Fig. 6-17.

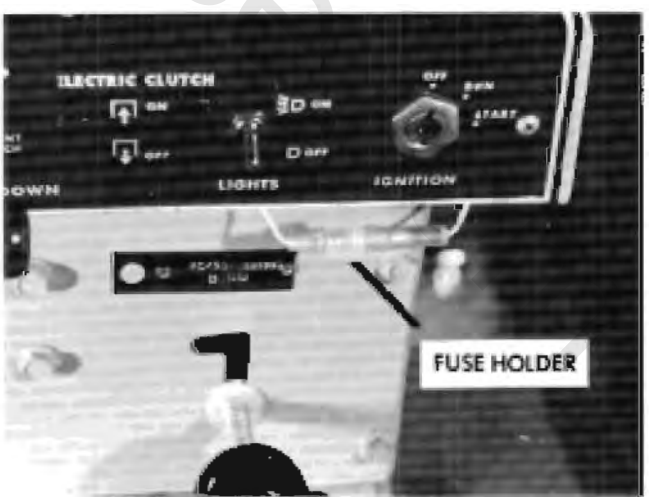


Fig. 6-17 D-Series Fuse Holder

Wiring Harness

Harness routing for the D-Series is shown in Figures 6-18, 6-19, and 6-20. Refer to the D-Series respective model electrical circuit diagram for connections when servicing or replacing the entire harness. See Fig. 6-21 and 6-22.

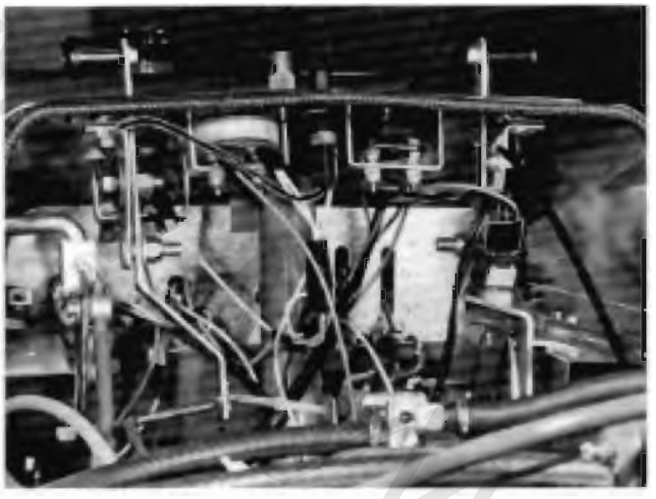


Fig. 6-18 D-Series Control Console Wiring (D-200 Shown)

Fig. 6-19 D-Series Headlight and PTO Wiring (D-160 Shown)

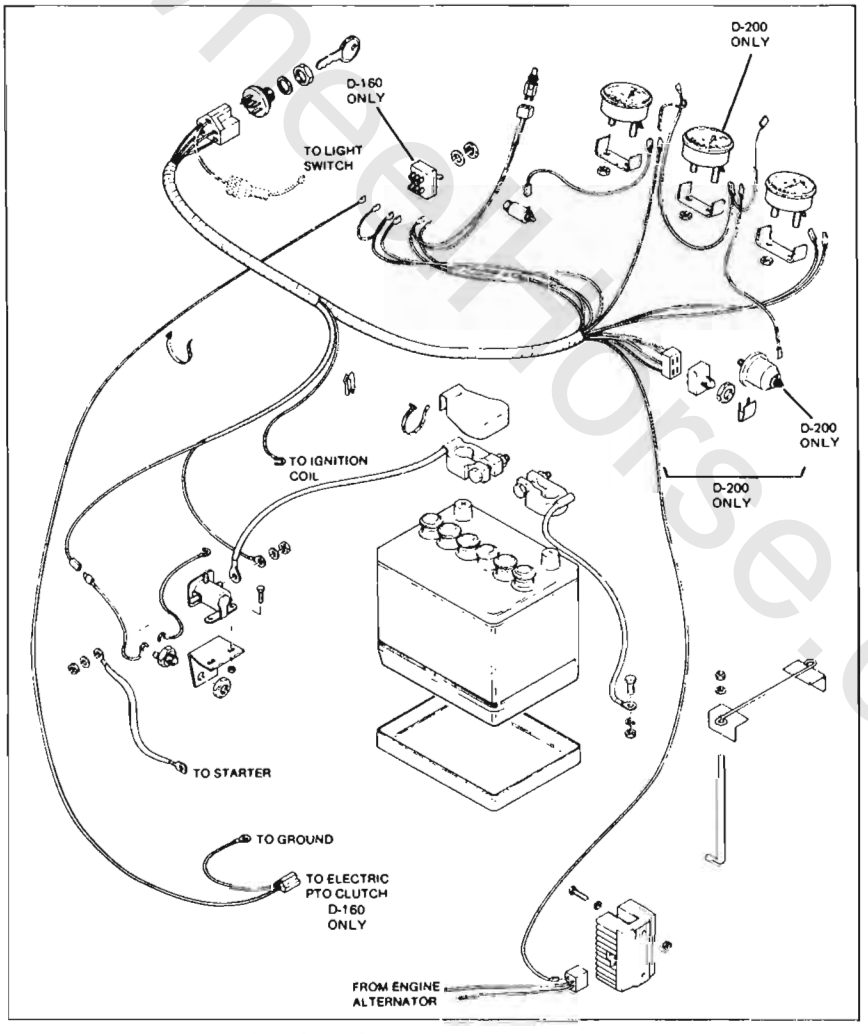


Fig. 6-20 D-Series Harness Routing

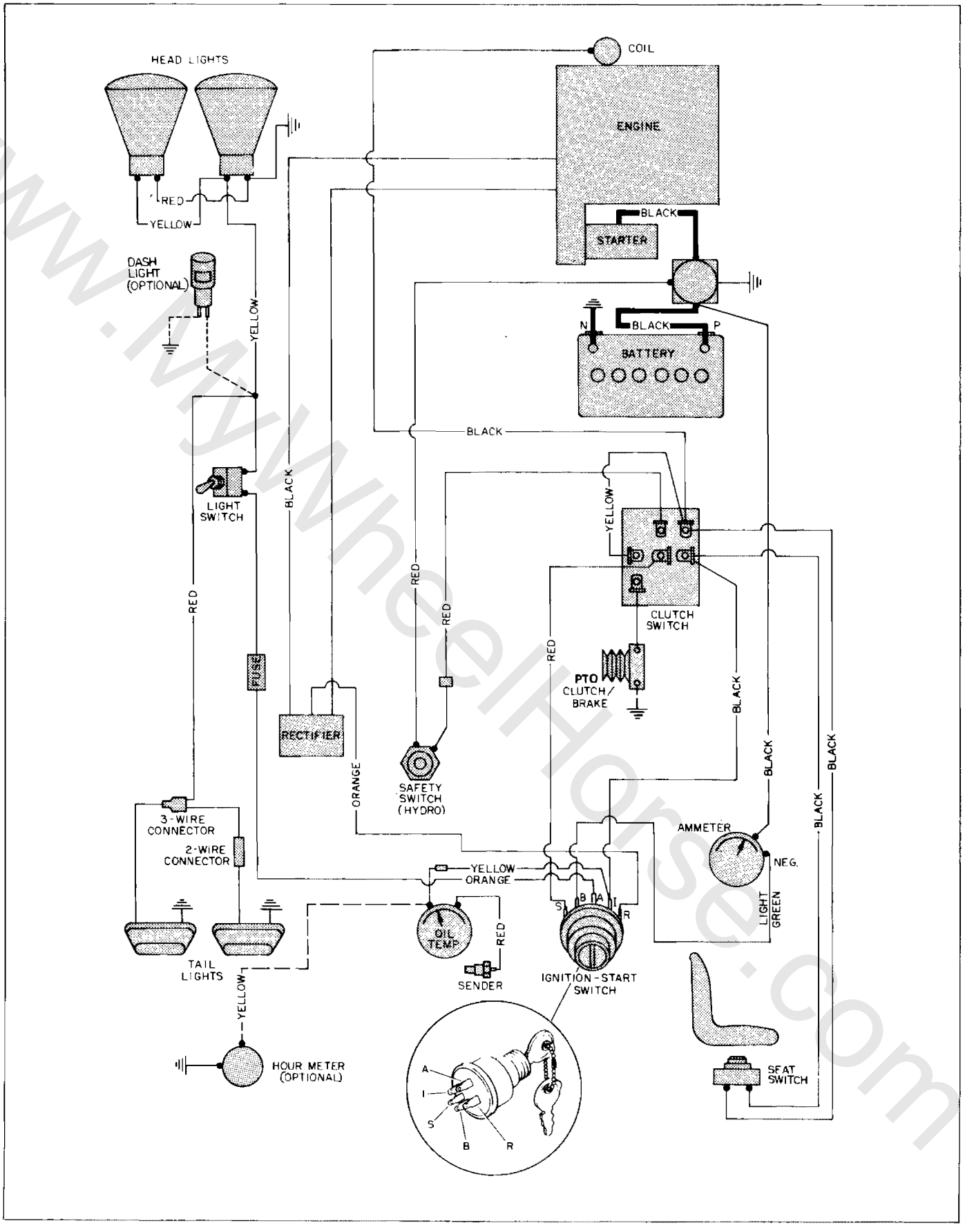


Fig. 6-21 D-160 Wiring Diagram

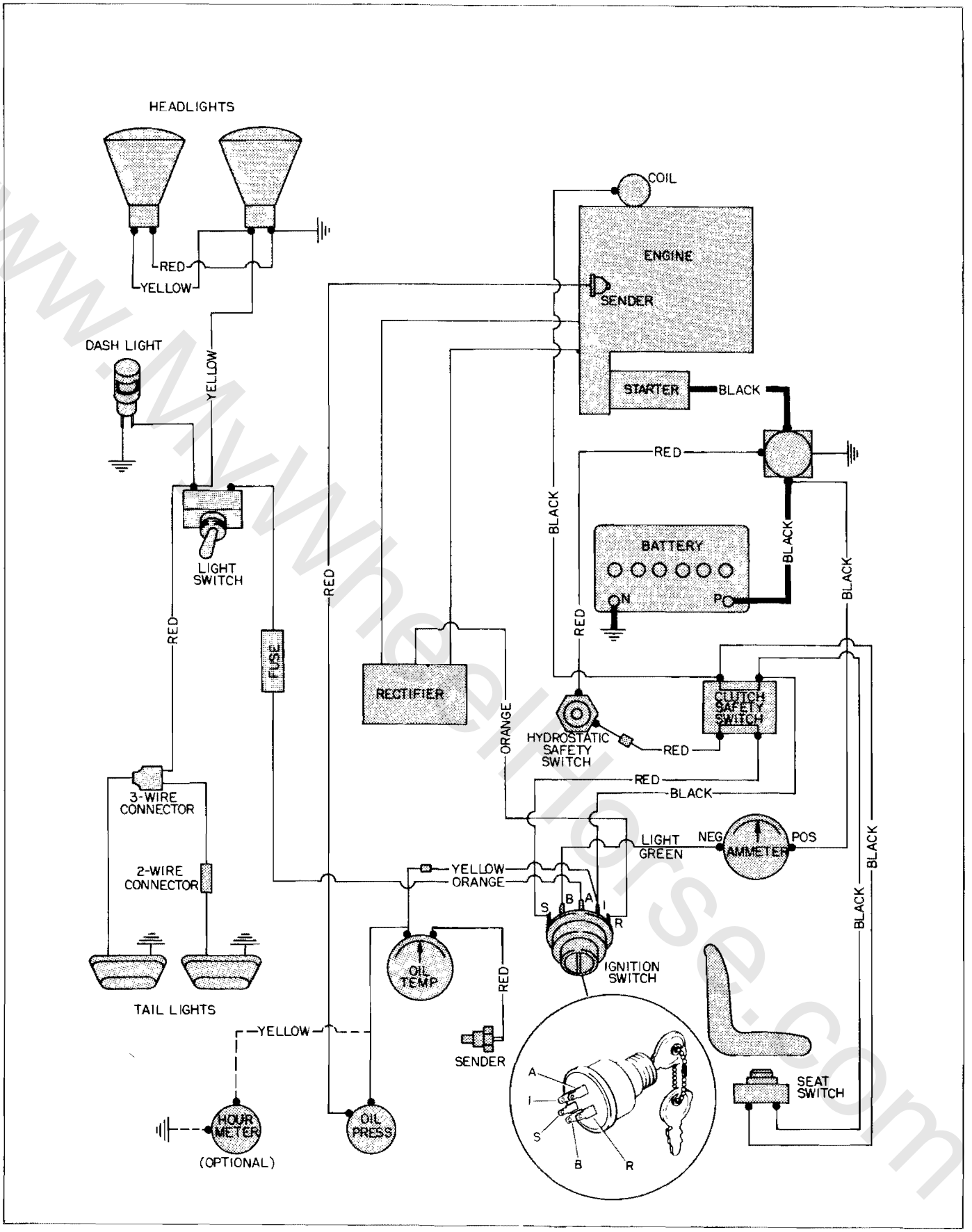


Fig. 6-22 D-200 Wiring Diagram

C-161 TWIN

IGNITION SYSTEM

The C-161 Twin uses magneto ignition. A relay is used to ground the magneto, which stops the engine. The ignition switch is used to supply voltage to the relay, and engage the starter solenoid.

The ignition switch continuity test is performed as follows with the switch totally disconnected:

Position	Terminals
OFF	no continuity
RUN	B&R&I&A
START	B&S&I

Continuity between these terminals in the positions shown indicates a good switch.

Do not interchange C and D-Series ignition switch with B-Series even though they look identical.

CHARGING SYSTEM

The C-161 Twin is equipped with a dual circuit alternator. One circuit provides 12 volts AC (alternating current) to power the lights. The lights will NOT operate without the engine running.

The second circuit provides charging current (12 volts DC) to the battery.

Never interconnect the AC light circuit and the DC battery circuit as charging system may be seriously damaged.

The alternator charging system requires no service other than periodically checking that all exposed wiring and electrical connections on the tractor are clean, tight, and in good condition.

Disconnect the alternator wires plug when charging the battery in the tractor or when using a booster battery to start the engine. The alternator wires plug is located on top of the engine.

Proper polarity is critical with an alternator equipped charging system. Always disconnect the battery ground cable (negative) before working on any part of the electrical system. Verify all components are connected correctly before reconnecting the ground cable (negative) or damage to alternator system components will result.

Never run the engine if the battery is removed, or if the battery is not connected to the charging system. Serious damage to charging system components may result.

CHARGING SYSTEM TEST

The overall charging system is tested by placing a DC voltmeter across the battery terminals with the engine running at full throttle. The reading should be at least 13.5 volts.

AMMETER TEST

To test ammeter, start the engine. Ammeter should indicate discharge while the engine is cranking. The ammeter reading will be around zero at idle speed; a constant charge reading will be indicated at full engine RPM.

INTERLOCK SWITCHES

Same as C-Series.

SEAT SWITCH

A seat switch is incorporated on C-Series tractors. If the driver rises off his seat with the PTO engaged, the seat switch interrupts the relay coil voltage which grounds the magneto, causing the engine to stop. The seat switch has no effect on the tractor unless the PTO lever is engaged.

The engine can be started without the seat switch being depressed.

The seat switch is located under the seat in the seat pan. See Fig. 6-10. To replace the switch, remove the transaxle oil dip stick for finger access to the switch. Remove the nut from the top of the switch and pull the switch from the seat pan.

LIGHTING CIRCUIT

The C-161 incorporates an alternator system (12V A.C.) for lighting only. The lights work only when the engine is running.

WIRING HARNESS

Harness routing for the C-161 Twin is shown in Fig. 6-23. Refer to C-Series electrical circuit diagram for connections when servicing or replacing the entire harness. See Fig. 6-24.

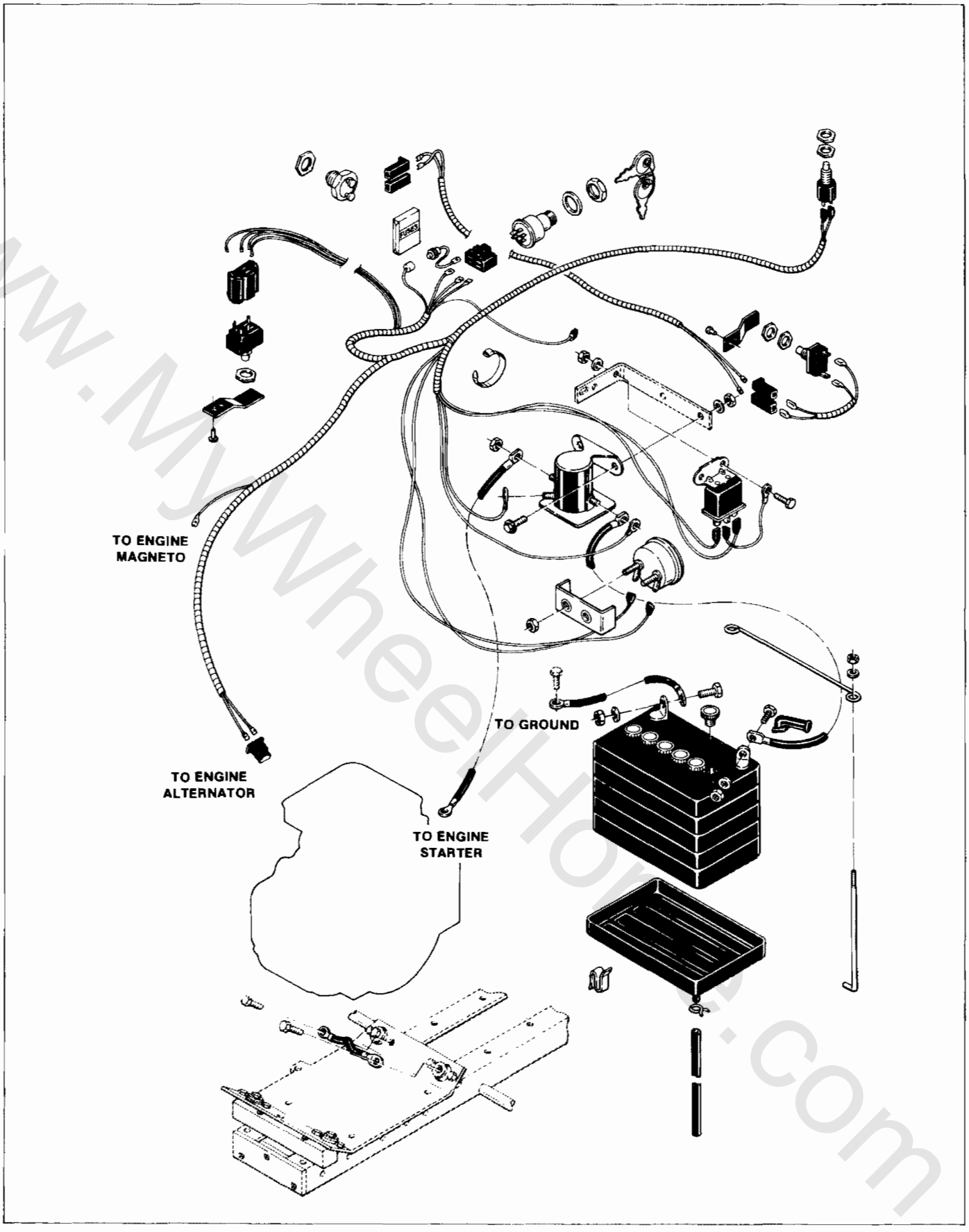


Fig. 6-23 C-161 Twin Harness Routing

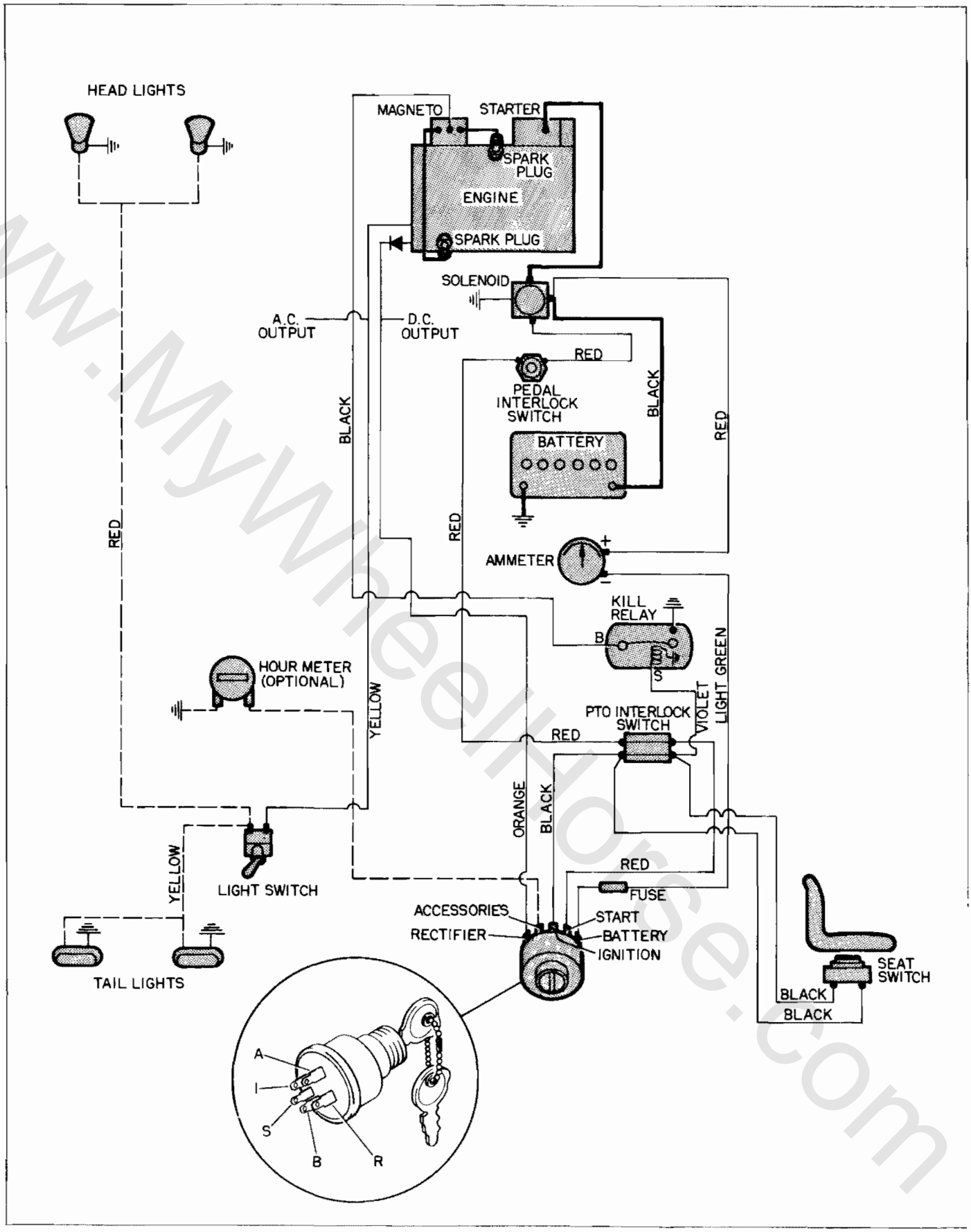


Fig. 6-24 C-161 Twin Wiring Diagram

ATTACHMENT LIFTS

B-SERIES

The B-Series incorporates no attachment lift mechanism. Refer to the manual supplied with each attachment for mounting instructions. Transport lift accessory 8-6717 may be added for use with rotary mowers.

C-SERIES

Attachment Mounting Locations

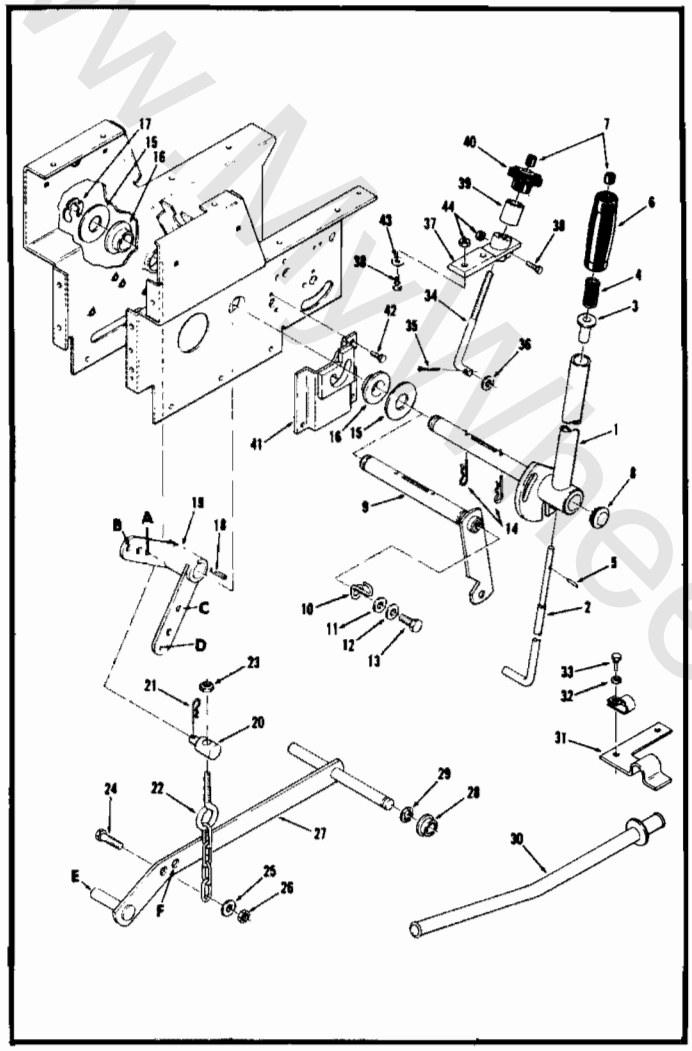


Fig. 7-1 C-Series Lift Linkage

The lift bellcrank, No. 19 in Fig. 7-1, is actuated by the lift lever No. 1, or on C-141, C-161 Automatic models by a hydraulic cylinder. The lift linkage, on certain attachments, connects directly to the bellcrank. Other attachments connect their lift linkage to the lift bar No. 27. Use the following chart for correct linkage locations:

Attachment	Linkage
Rotary Mower and Mid Mount Cultivator	Trunnion No. 20 in Hole "A" of Bellcrank No. 19. Slip Pin "E" of Lift Bar No. 27 into attachment linkage.
Dozer Blade and Grader Blade	Trunnion No. 20 in Hole "A" of Bellcrank No. 19. Attach blade linkage to Hole "F" of Lift Bar No. 27. For additional blade height, place trunnion No. 20 in Hole "B".
Snowthrower	Attach Snowthrower Linkage to Hole "C" of Bellcrank No. 19.
Tiller, Slot Hitch and Clevis Hitch	Attach Rear Lift Cable to Hole "D" of Bellcrank No. 19.

Mid Lift Trunnion Adjustment

Adjust trunnion No. 20, nut No. 23, and eyebolt No. 22 so rubber bumpers on mower press firmly on bottom of footrests when lift is fully raised.

Rear Lift Trunnion and Chain Adjustment — Rear Mount Attachments

The chain adjustment has two positions, operational and transport. For operation, the implement clevis is placed in the last link of the lift chain. For transportation, the second last link is usually used.

The rear lift trunnion, located under the gas tank, is used to adjust optimum height of the rear lift chain for best use of each implement used. This rear lift trunnion is a "fine" adjustment that complements the chain adjustment.

Remove Lift Linkage

Refer to Fig. 7-1 during the following procedure.

1. Remove belt guard.
2. Remove left side panel and footrest.
3. Remove two hairpin cotters No. 14 from lift shaft No. 9 or 1.
4. Remove one hairpin cotter No. 21 from chain trunnion No. 20.
5. Disconnect Dial-A-Hite control rod No. 34.
6. Remove circlip (large) No. 17 from right side of lift shaft No. 1 or 9. Remove paint from shaft.
7. Pull lift lever or shaft No. 9 from left side to reveal key No. 18.
8. Remove key No. 18.
9. Remove lift lever or shaft No. 9 and bellcrank No. 19.

Remove Hydraulic Cylinder

Refer to Fig. 7-1 and Fig. 7-2 during the following procedure.

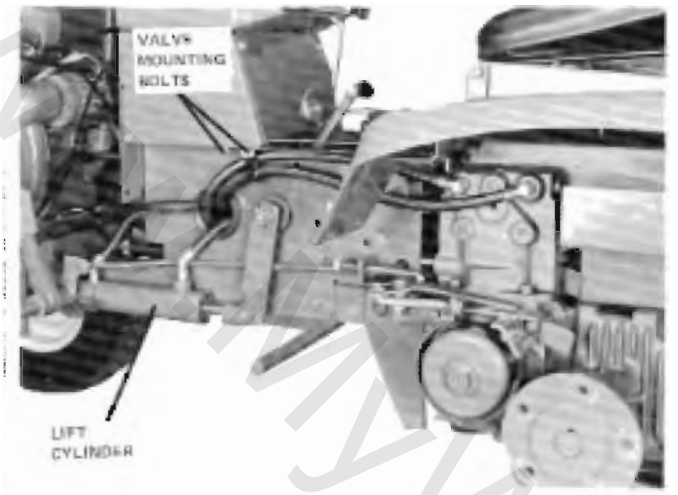


Fig. 7-2 C-Series Hydraulic Lift System

1. Remove left side panel and footrest.
2. Disconnect hydraulic cylinder from lift shaft No. 9.
3. Disconnect hydraulic hoses from cylinder noting hose locations.
4. Disconnect brake pedal from brake rod.
5. Remove collar from brake pedal shaft.
6. Slide brake pedal, spacer, washer, and cylinder off shaft.

Overhaul Hydraulic Cylinder

Refer to Fig. 7-3 during the following procedure.

1. Remove circlip No. 1 at end of hydraulic cylinder.
2. Withdraw piston No. 2 and all seals.
3. Replace "O" rings, gaskets, and seals with parts supplied in rebuild kit, shown as No. 3 in Fig. 7-3.

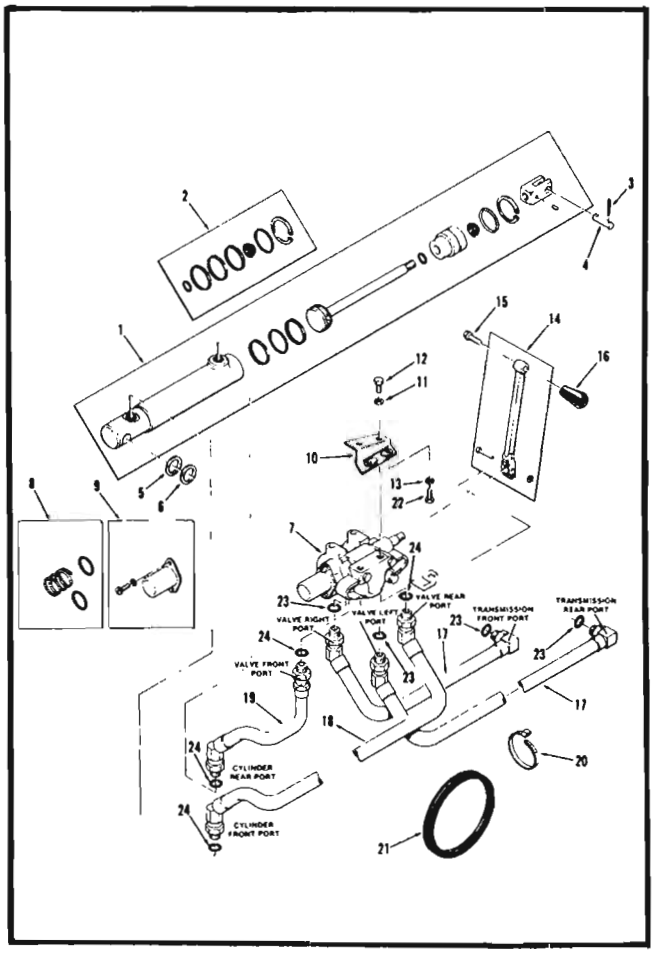


Fig. 7-3 C-Series Hydraulic Lift Components

Remove Hydraulic Valve

1. Remove left side panel exposing cylinder and four hydraulic hose connections. See Fig. 7-2. Mark two rear hoses for identification during reassembly.
2. Disconnect 4 hydraulic hoses, two from the cylinder and two from the pump.
3. Disconnect battery negative terminal.
4. Remove ammeter mounting panel and disconnect two (2) connectors from ammeter. See Fig. 7-4.
5. Remove controls cover plate.

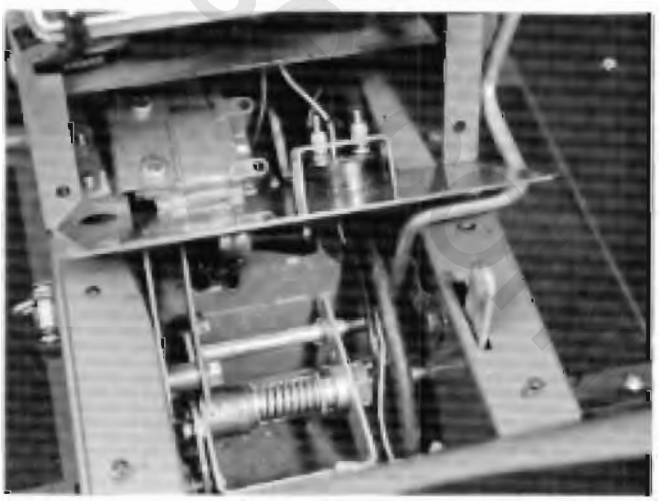


Fig. 7-4 C-Series Hydraulic Valve Removal

6. Remove two mounting bolts holding valve bracket to hoodstand. See Fig. 7-2.
7. Remove the valve and hose assembly, guiding the hoses through the large grommet in the frame.

For proper hose connections, see Fig. 7-5. After reassembling, check transaxle oil level after running the engine and operating the lift system for one (1) minute.

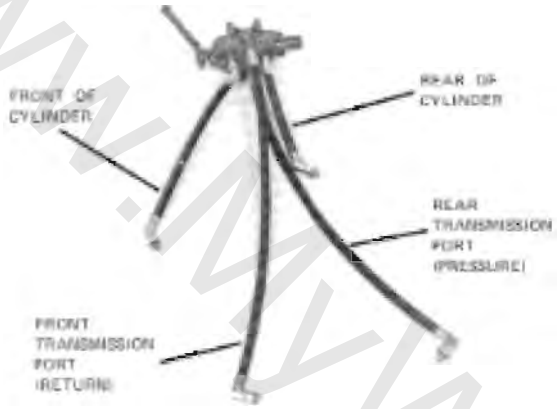


Fig. 7-5 C-Series Hydraulic Valve Hose Connections

Remove Hydraulic Valve Handle

1. Remove left side panel.
2. Disconnect battery negative terminal.

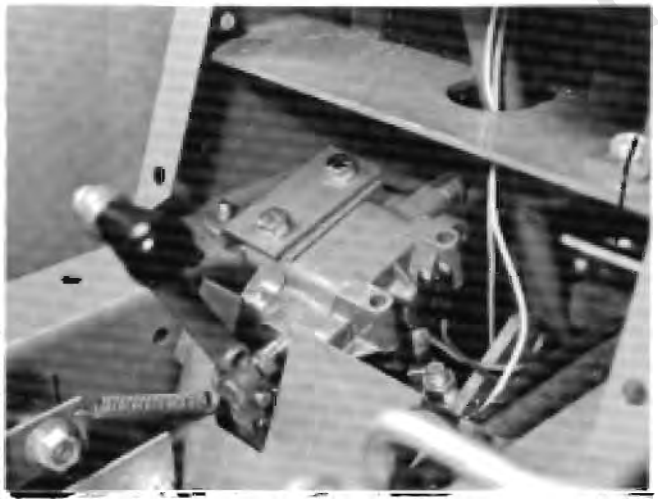


Fig. 7-6 C-Series Hydraulic Valve

3. Remove ammeter mounting panel and disconnect two (2) connections from ammeter.
4. Remove controls cover plate.
5. Remove two mounting bolts holding valve bracket to frame. See Fig. 7-2.
6. Tilt valve for access to push nut and pin.
7. Replace handle and reassemble using new push nut.

Overhaul Hydraulic Valve

1. Remove valve and hoses from tractor (see Remove Hydraulic Valve).

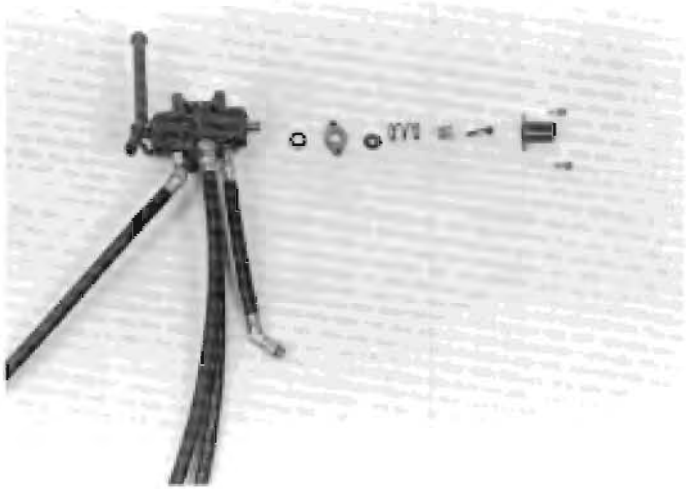


Fig. 7-7 C-Series Hydraulic Valve Overhaul

2. Remove spool cap and 1/8 inch allen bolt.
3. Replace "O" ring and spring.

> When reassembling valve, make sure Allen head bolt clears washer under spring.

Remove Hydraulic Hoses

The entire hydraulic valve must be removed to replace any or all hoses. Follow procedure for Remove Hydraulic Valve.

D-SERIES, Automatic

Attachments Mounting Locations

The lift bellcrank No. 1 in Fig. 7-8 is actuated by the hydraulic lift cylinder.

For each attachment, a specific hole in the lift bellcrank is used for mounting attachments. The following chart depicts the lift bellcrank hole to be used for a specific attachment.

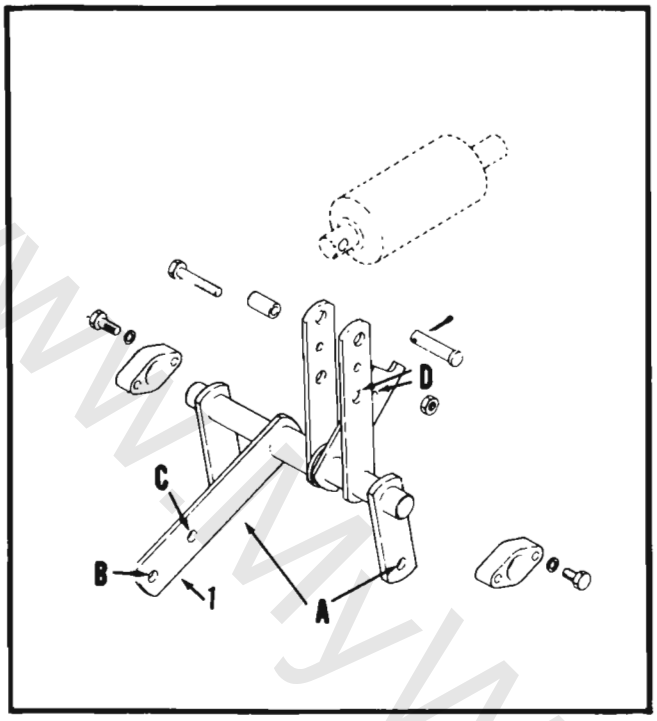


Fig. 7-8 D-Series Lift Linkage

Hole	Attachment
A	Snow Thrower
B	Mower Grader Blade
C	Dozer Blade
D	Float Lockout Pin (Grader Blade)

To lock out the float feature, insert the 1/2 x 2 clevis pin supplied with the grader blade through the two holes of the lift arms and the hole in the float arm. Secure the pin with the large hairpin cotter. Never use the mower or snowthrower with pin installed.

Remove Hydraulic Lift Mechanism

Refer to Fig. 7-8 during the following procedure.

1. Remove access cover plate in front of seat.
2. Remove cotter pin and clevis pin from cylinder rod.
3. Remove four (4) bolts from bellcrank pivot bearings.
4. Lower bellcrank assembly through bottom of frame.

Remove Hydraulic Cylinder

1. Remove access cover plate in front of seat.
2. Disconnect hoses from front and rear of cylinder. Note connections for reinstallation. See Fig. 7-9.

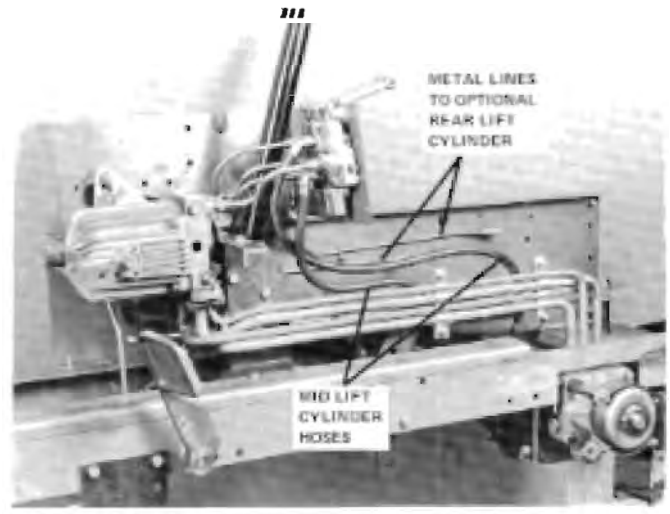


Fig. 7-9 D-Series Hydraulic Hose Routing

3. Remove cotter pin and clevis pin from cylinder rod separating bellcrank from cylinder.
4. Remove snap ring from left side of rear pivot pin and slide pin to the right.
5. Remove hydraulic cylinder.

After reassembling, check transaxle oil level after running the engine and operating the lift system for one (1) minute.

Remove Hydraulic Valve

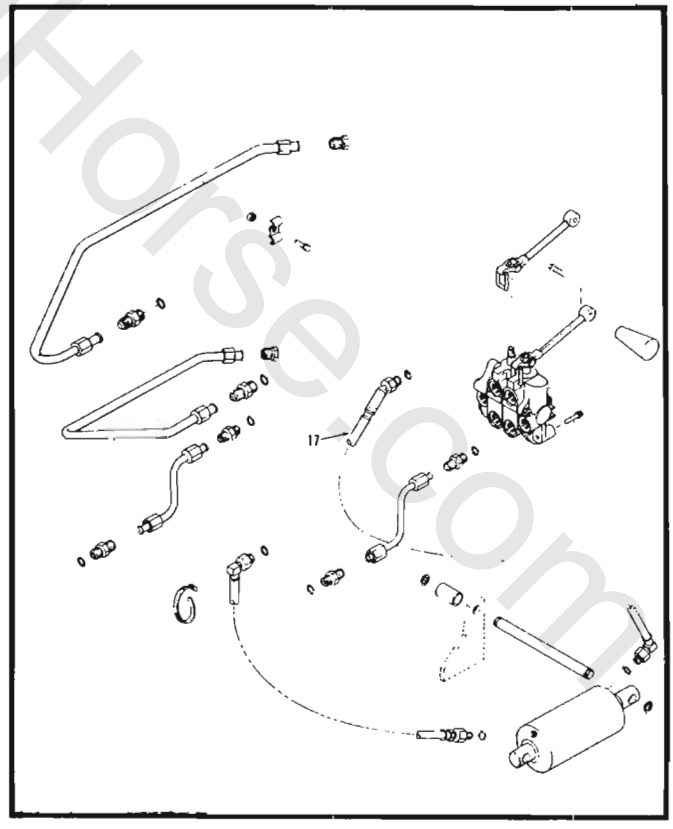


Fig. 7-10 D-Series Hydraulic System

1. Disconnect and remove battery.
2. Remove left side access plate.
3. Disconnect two hoses and four metal tubular lines from valve assembly. Note connections for reinstallation.
4. Remove park brake knob, spring, and washer.
5. Remove two bolts at right side of parking brake guide plate, and remove plate with hydraulic valve attached.
6. Remove three bolts securing valve body to parking brake guide plate.

After reassembling, check transaxle oil level after running the engine and operating the lift system for one (1) minute.

Remove Hydraulic Valve Handle

1. Disconnect battery ground cable.
2. Remove switch nut from light switch. On D-160, also remove switch nut from PTO switch.
3. Remove top and two outside screws from lower instrument panel. Swing panel out of the way.
4. Remove nut and clevis pin from valve handle.
5. Slide handle off "S" link.
6. Replace handle using new push nut supplied with new handle.

Overhaul Hydraulic Valve

Same procedure as C-Series.

Remove Hydraulic Hoses

1. Remove battery.
2. Remove left side access plate, and access cover plate located over hydraulic cylinder.
3. Remove hoses at cylinder and valve assembly. See Fig. 7-9.

After reassembling, check transaxle oil level after running the engine and operating the lift system for one (1) minute.

C-161 TWIN

Same as C-Series

NOTES

CHASSIS
B and C-SERIES

Steering Shaft Adjustments

Both B and C-Series use similar linkage.

Upper Adjustment

1. Release the set screw on the collar.
2. Press down on the steering wheel.

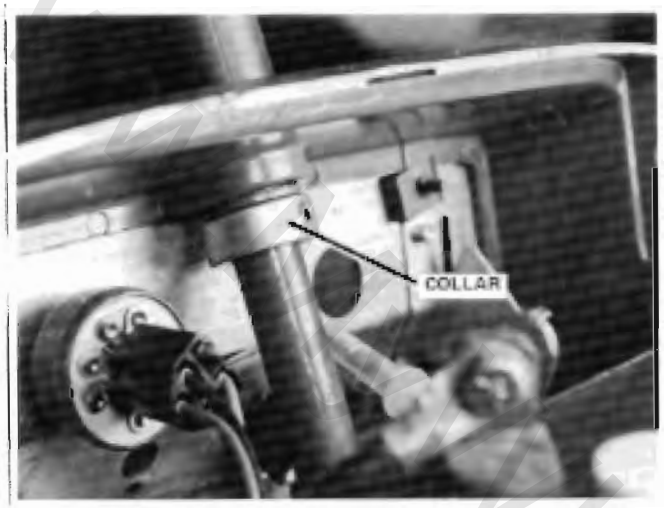


Fig. 8-1 B and C-Series Upper Steering Adjustment

3. Slide collar up against bushing and tighten set screw.

Lower Adjustment

Gear mesh is adjusted as follows:

1. Remove cotter pin from lower steering shaft.

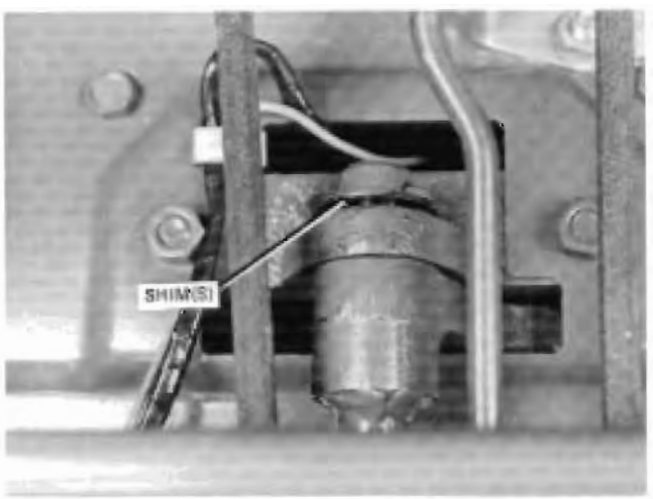


Fig. 8-2 B and C-Series Lower Steering Adjustment

2. Add or remove enough shims so that 0 to .015 inch (.4 mm) end play remains in shaft.

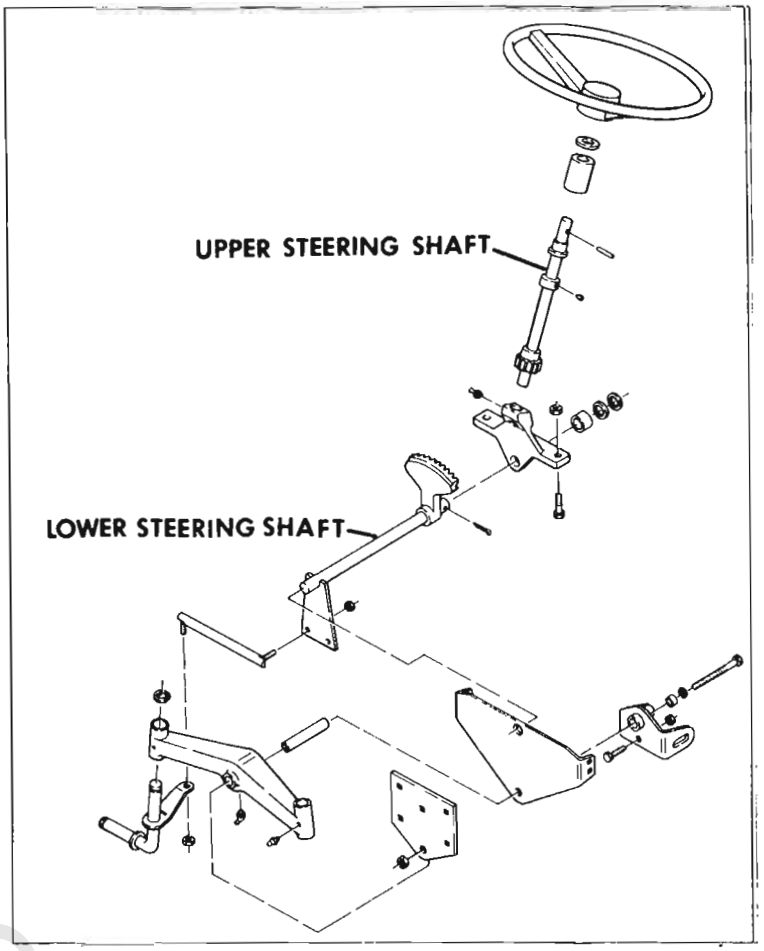


Fig. 8-3 B-Series Steering

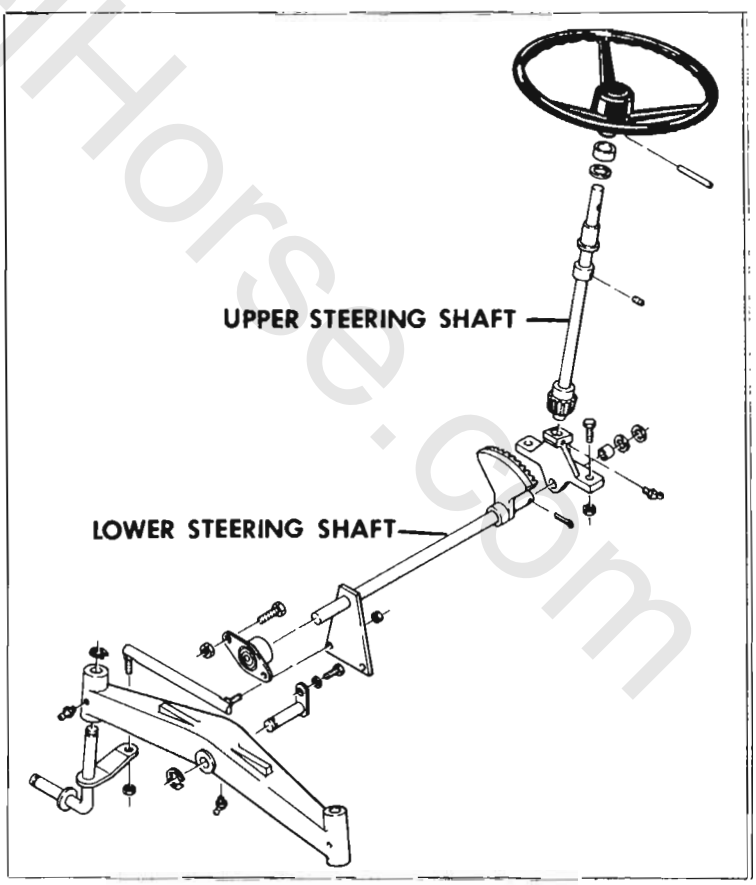


Fig. 8-4 C-Series Steering

SECTION 8

D-SERIES

Wheel Alignment Adjustment

Toe-in amount should be 1/16 to 1/8 inch with the wheels straight ahead.

Turn steering wheel full right and then full left. Steering arms welded to the spindles should stop an equal distance from their respective stops. If adjustment is necessary, proceed as follows:

1. Adjust the tie rods to obtain correct amount of toe-in.
2. Set steering gear on center by counting exact number of turns of the steering wheel, from full left to full right.
3. Set wheel at center of travel.
4. Equalize the steering arm to axle stop clearance by adjusting the length of the steering drag link. Wheels should now be pointing straight ahead.

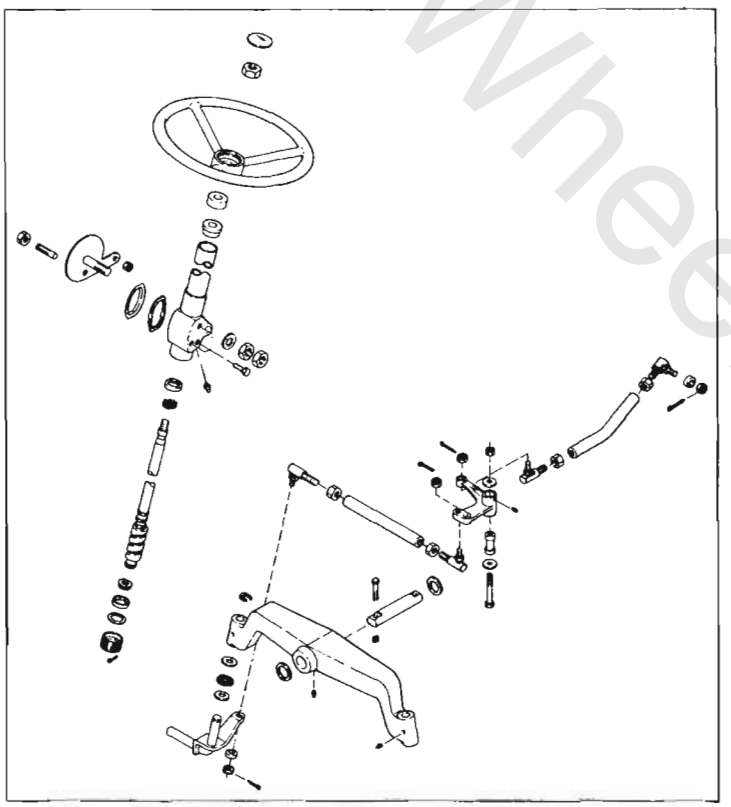


Fig. 8-5 D-Series Steering

5. Remove steering wheel from upper shaft and reposition the wheel spokes and insert if necessary.

Remove Steering Gear

1. Remove steering wheel and foam dust cover.
2. Disconnect the drag link from steering gear lever.
3. Cut any wire ties holding electrical wiring to steering column.
4. Remove through bolts holding gear housing to steering gear bracket. See Fig. 8-6.
5. Remove steering gear assembly from the bottom.

Fig. 8-6 Steering Gear Bracket

Install Steering Gear

Steering gear is installed from the bottom.

1. Line up steering post and jacket.
2. Push steering gear up through the grommet in the console.
3. Insert the two lever shaft nuts through the large hole in the bracket.
4. Align and install the three bracket to steering gear bolts.
5. Center the jacket in the console grommet and tighten the three bolts evenly.
6. Connect the drag link to the steering arm.
7. Install the steering wheel on the splined upper shaft.
8. Check steering alignment by performing steps 2 through 4 under Wheel Alignment Adjustment.

Overhaul Steering Gear – Disassembly

1. Place the steering gear assembly in a vise.
2. Back off the locknut and loosen the lever stud adjusting screw.

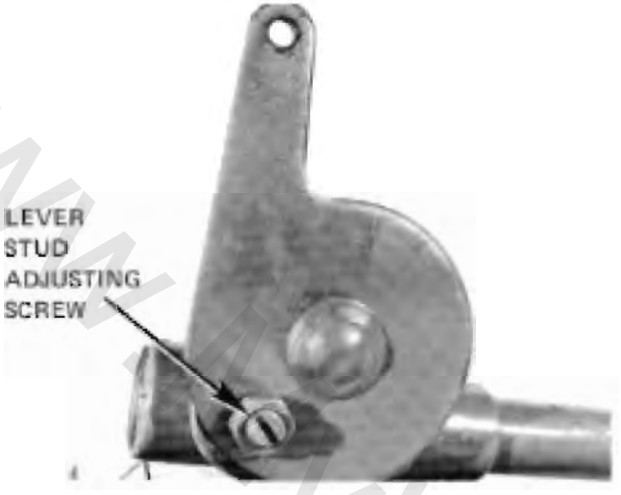


Fig. 8-7 Steering Gear Lever

3. Remove both large nuts and washer and remove the lever and shaft assembly.

Fig. 8-8 Lever and Shaft

4. Remove the cotter pin and adjusting plug from the end of the steering gear housing.
5. Remove the steering post, worm, and bearings from the housing.

Fig. 8-9 Adjusting Plug

The disassembled steering gear is shown in Fig. 8-10.

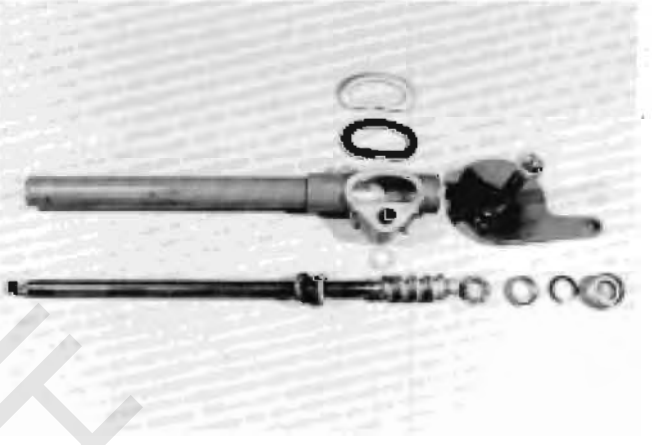


Fig. 8-10 Steering Gear Disassembled

Overhaul Steering Gear – Assembly

1. Place the main housing firmly in a vise.
2. Lubricate and place the upper and lower ball bearings and races on the worm shaft.
3. Insert the worm and bearings into the housing.

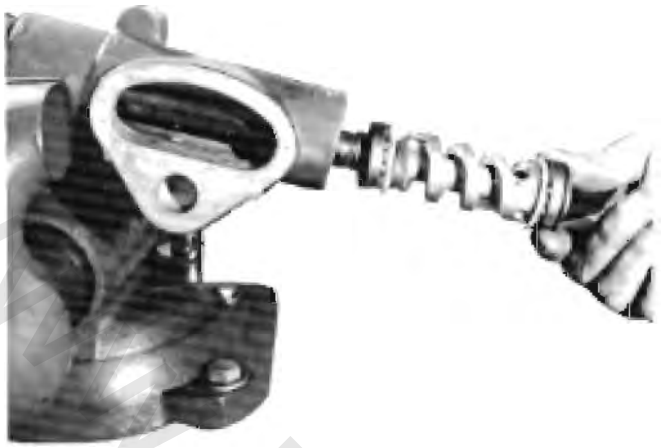


Fig. 8-11 Steering Gear Housing

4. Install the spring washer in the adjusting plug and thread the plug into the housing.
5. While turning the post and worm, screw the adjusting plug in place until all end play is removed.

Fig. 8-12 Adjusting Plug Installed

6. Tighten until a slight drag is felt while turning the steering shaft.
7. Install the cotter pin to lock the adjusting plug in place.

If the cotter pin does not line up with a slot after plug adjustment, back out plug to align nearest slot.

8. Back off the lever adjusting stud and insert the lever shaft into the housing assembly.
9. Install the washer and two nuts but do not tighten.
10. Install 3/32 inch thick washer as a gauge between the lever and housing as shown.
11. Tighten the inside nut until the lever is just against the gauge washer.

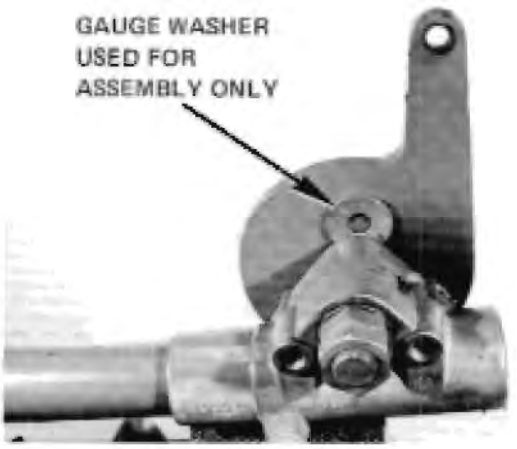


Fig. 8-13 Lever Gauge Adjustment

12. Tighten the lock nut against the inside nut and remove the 3/32 inch gauge washer.
13. Turn the steering shaft from full left to full right.
14. Use a screwdriver to tighten the lever stud until the high spot (slight drag) is just felt as you pass through the center of travel.

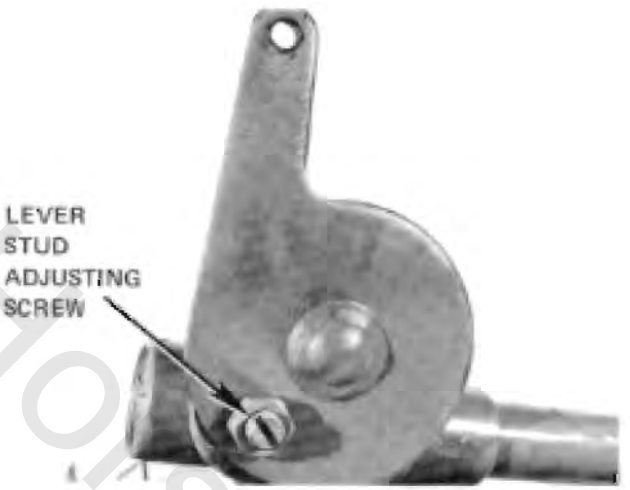


Fig. 8-14 Adjusting Lever Stud

15 Hold the stud and tighten the locknut securely. Check for proper operation and make sure the adjustment did not move when locking the nut.
16. Check steering alignment by performing steps 2 through 4 under Wheel Alignment Adjustment.

Lever stud adjustment may be made in the tractor using a stubby screwdriver. Make sure to disconnect the drag link, isolating the gear from the linkage.

C-161 TWIN
Same as C-Series.

POWER TAKE-OFF (PTO)

B-SERIES

PTO Clutch/Brake Adjustment

The PTO clutch and brake may require periodic adjustment due to normal wear of friction surfaces.

1. Engage PTO clutch.
2. Loosen the locknut on the PTO brake adjustment screw.
3. Turn the adjustment screw so there is a .010" (.25 mm) gap between the brake pad and the clutch pulley face.
4. Tighten the locknut securely.
5. Check that the gap between the washer on the PTO rod and the clutch/brake bracket is 1/4 inch (6.4 mm).
6. If clutch adjustment is necessary, change the length of the PTO rod using the turnbuckle on the rod. Loosen the locknut behind turnbuckle and remove the hairpin cotter and clevis pin from the opposite end of the turnbuckle.

> It may be necessary to readjust the PTO brake after this adjustment is made.

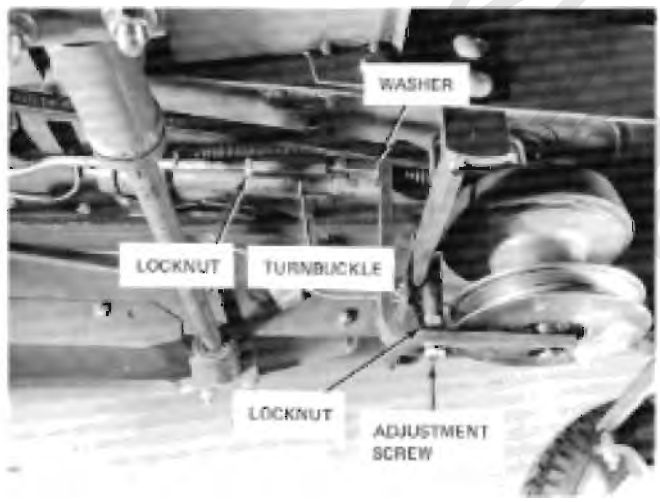


Fig. 9-1 B-Series PTO Adjustments

Remove PTO Clutch

1. Separate PTO linkage under frame by removing clevis pin and hairpin cotter at PTO clutch turnbuckle.
2. Remove PTO brake adjustment screw and bracket.
3. Remove PTO clutch cone assembly.
4. Remove crankshaft bolt and bearing race.

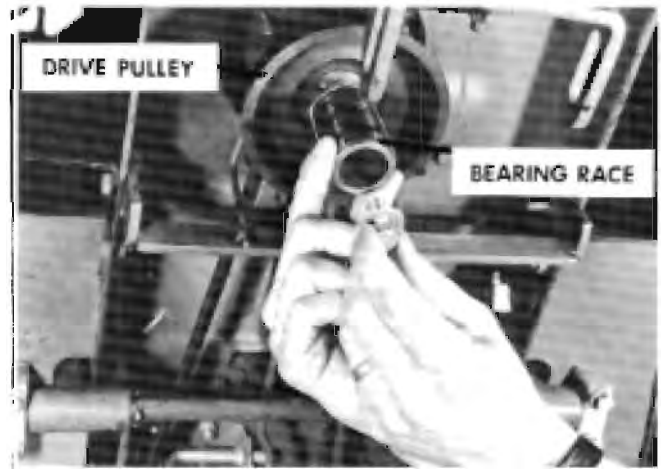


Fig. 9-2 B-Series PTO Clutch Removal

5. Relieve drive belt tension by depressing clutch pedal and remove PTO clutch housing from drive shaft.

Reverse above procedure for installation of PTO clutch.

C-SERIES

PTO Clutch Adjustment

Adjustment is required only when the PTO clutch slips noticeably. If clutch slippage is apparent, turn the trunnion toward the rear of the rod in one-turn intervals until clutch slippage is eliminated.

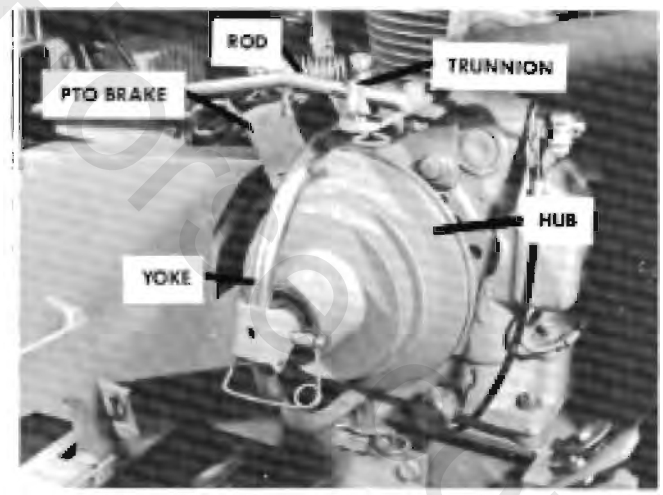


Fig. 9-3 C-Series PTO Adjustments

PTO Brake Adjustment

1. Engage the PTO clutch.
2. Loosen the two bolts that hold the brake pad bracket to the support bracket.
3. Place a .012 inch (.3 mm) feeler gauge between the brake pad and the clutch pulley.
4. While holding the brake pad against the feeler gauge and pulley, tighten the two brake bracket bolts.

Remove PTO Clutch

1. Disconnect PTO clutch rod and spring at trunnion.
2. Remove yoke pin and swing yoke aside.
3. Remove PTO brake.
4. Slide PTO hub off shaft.
5. Remove 4 bolts holding locking plates onto clutch plate and face.
6. Slide bearing race off shaft.
7. Remove clutch plate and facing.

Reverse above procedure for installation of PTO clutch.

D-SERIES

PTO Clutch Adjustment (D-160)

The electric PTO clutch on the D-160 is self-compensating for wear and does not require adjustment. If clutch problems are encountered, check the stator, PTO switch and wiring for continuity. Replace the rotor if the clutch friction surface is excessively worn.

PTO Brake Adjustment (D-160)

To adjust the PTO brake:

1. Remove the grille.
2. Position a piece of .012 inch (.3 mm) shim stock in each of the four slots in the brake flange.
3. Turn ignition switch to Run position and PTO switch to On position.
4. Tilt the tractor's seat forward and place a weight on the seat switch button, sufficient to actuate it.
5. Loosen the four locknuts holding the brake flange.
6. Push on the brake flange until it bottoms out and re-tighten the four locknuts. Do not over-tighten.
7. Turn PTO switch to Off position and remove ignition key.
8. Recheck the gap at all four positions with a feeler gauge. The gap should be between .010 and .015 inches (.3 and .4 mm).

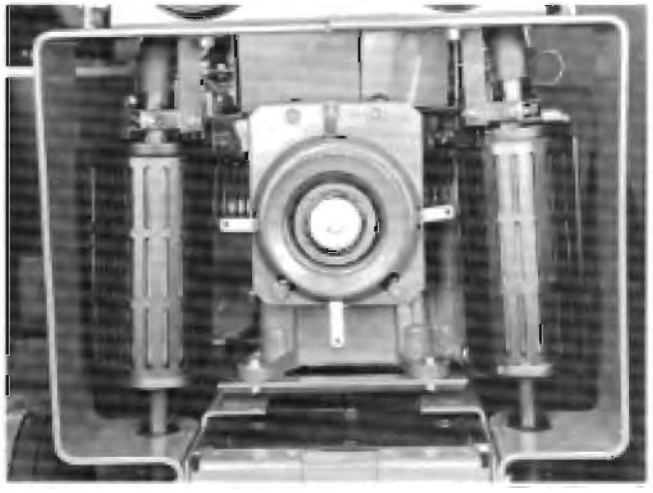


Fig. 9-4 D-160 PTO Adjustment

PTO Clutch Adjustment (D-200)

To adjust the PTO clutch:

1. Remove the grille and disengage the PTO clutch.
2. Loosen the two brake bracket bolts.
3. Loosen the lock nuts and adjust the turnbuckle on the clutch rod so that the rear clutch plate facing just clears the pulley, allowing it to be turned freely by hand.
4. Engage PTO clutch and check tension. The washer at the front end of the clutch rod should just clear the trunnion so it can be turned by hand.
5. Adjust PTO brake.

Fig. 9-5 D-200 PTO Clutch Adjustment

PTO Brake Adjustment (D-200)

To adjust PTO brake:

1. Remove the grille and engage the PTO clutch.
2. Loosen the two brake bracket bolts.
3. Place a .012 inch (.3 mm) feeler gauge between the brake pad and the clutch pulley.
4. While holding the brake pad against the feeler gauge and pulley, tighten the two brake bracket bolts.

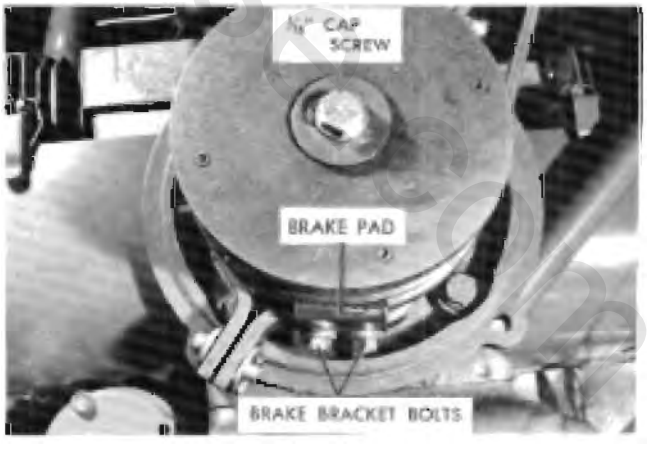


Fig. 9-6 D-200 PTO Brake Adjustment

Remove PTO Clutch/Brake (D-160)

1. Disconnect the PTO wire connector plug No. 9.
2. Remove four nuts No. 14 holding clutch housing to engine block.
3. Remove bolt No. 6, lockwasher No. 8, and large special washer No. 7 from center of shaft.
4. Slide clutch off crankshaft and remove springs No. 15.
5. Remove four machine screws No. 3, remove stator No. 2, and spacer No. 5.

To replace PTO clutch, reverse above procedure and adjust PTO brake.

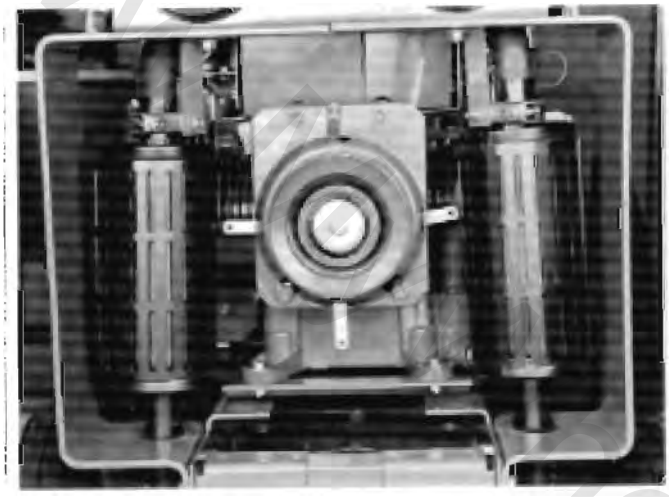


Fig. 9-7 D-160 Electric PTO Clutch

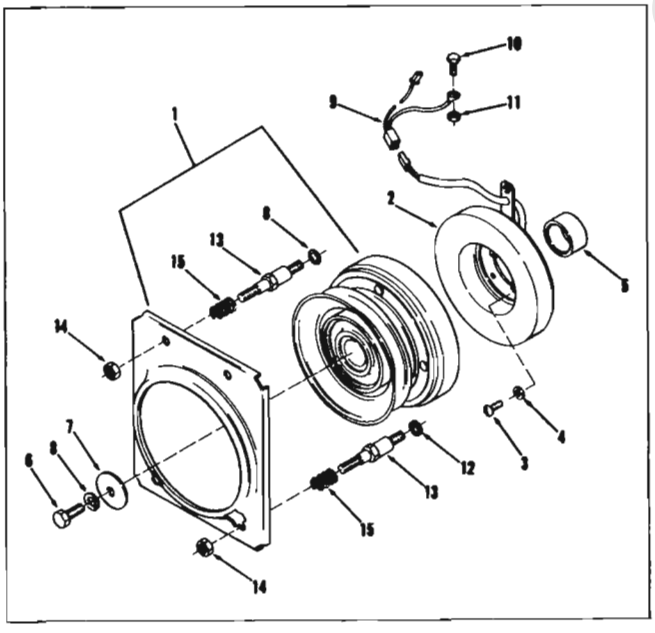


Fig. 9-8 D-160 Electric PTO Clutch

PTO Clutch/Maintenance (D-200)

After each 100 hours of operation or one year, whichever comes first, the PTO clutch on the D-200 should be cleaned and relubricated. This maintenance is covered as part of Clutch Disassembly and Reassembly, following.

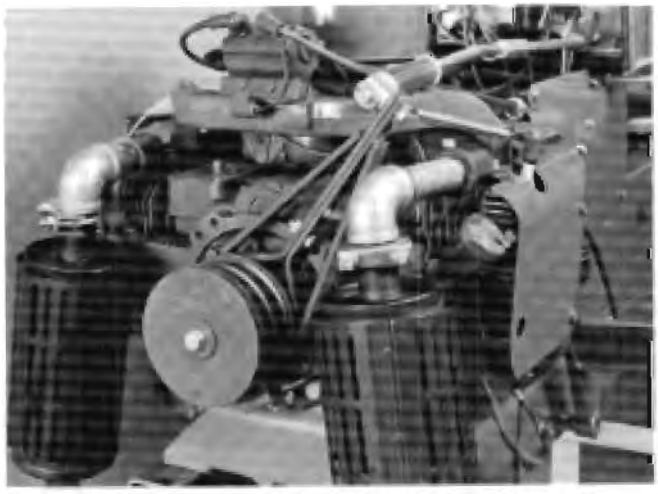


Fig. 9-9 D-200 PTO Clutch/Brake

Clutch Removal

1. Disconnect the clutch rod trunnion from the clutch bars.
2. Loosen the two brake bracket bolts, allowing the brake pad and bracket to hang down to clear the pulley.

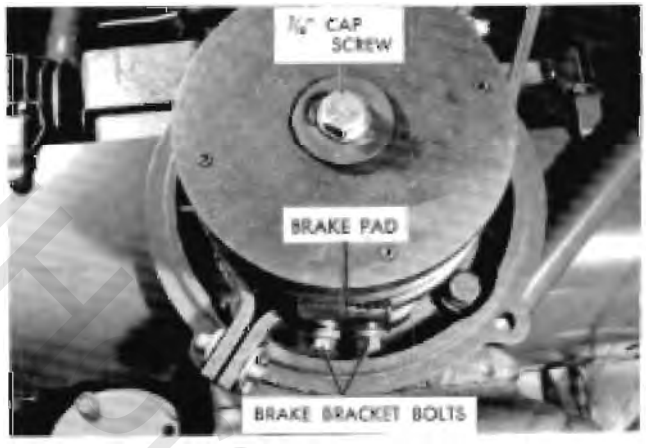


Fig. 9-10 D-200 Clutch Pulley Brake

3. Remove the clutch cap screw and special cap washer.
4. Remove the front plate and pulley assembly from the crankshaft.
5. Remove the 3/8 inch bolt and nut holding the clutch bars together.

Fig. 9-11 D-200 Clutch Removal

6. Remove the cotter pin and washer from the pivot hook.
7. Remove the two clutch bars from the hook and the clutch collar.

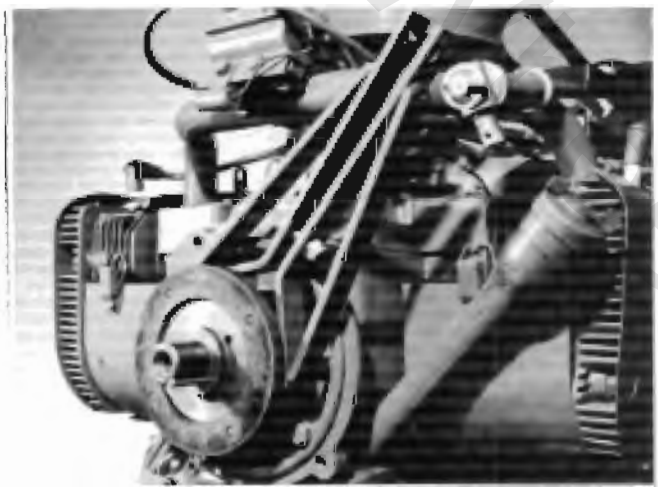


Fig. 9-12 D-200 Clutch Removal

8. Slide the clutch plate and the clutch collar off the crankshaft.

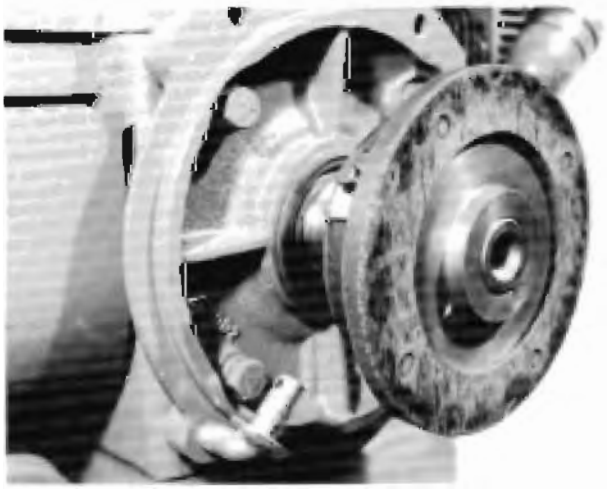


Fig. 9-13 D-200 Clutch Removal

Clutch Disassembly (D-200)

1. Press the pulley against the front clutch plate to compress the spring washers.
2. Remove the Spiroloc retaining ring.

Fig. 9-14 D-200 Retaining Ring Removal

3. Lift the pulley off the front clutch hub.
4. Remove the one plain washer and the four spring washers. Note the position of each washer as it is removed.

Fig. 9-15 D-200 Clutch Plate and Washers

Clutch Reassembly (D-200)

1. Clean the front clutch hub.
2. Apply a thin coat of "moly" grease on the hub where the washers and bearings go.
3. Install the spring washers as follows: the first washer cupped up, the second washer with the outer edges down. Then the third washer, like the first, has the outer edges up. Finally, the fourth washer with outer edges up.

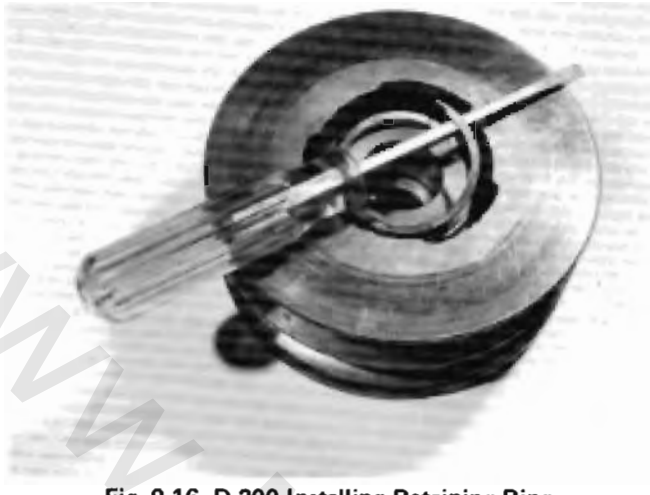


Fig. 9-16 D-200 Installing Retaining Ring

4. After the four cup washers are installed, place the plain washer on top of them.
5. Place the pulley and bearing assembly over the front clutch hub with the notched section of the pulley up.
6. Press the pulley against the spring washers and install the Spiroloc retaining ring.

Clutch Installation (D-200)

1. Check and adjust PTO clutch hook so that the hook centerline is 1 13/16 inch (4.6 cm) from the engine face.
2. Clean the crankshaft and key.
3. Apply a small amount of "moly" grease on the crankshaft and key.
4. Line up the keyway in the rear clutch plate with the key and slide the clutch plate and collar assembly onto the crankshaft.
5. Position the bottom end of the two clutch bars over the pivot hook and over their respective clutch collar guide pins.

Fig. 9-17 D-200 Installing Clutch Bar

6. Install the 3/8" bolt and nut to hold the clutch bars together.
7. Before tightening the bolt, install the clutch hook washer and cotter pin.
8. Make sure of the alignment of the two bars and then tighten the bolt and nut.
9. Place the spacer washer inside the front hub next to the internal snap ring. This determines the position of the hub on the crankshaft.
10. Line up the keyway of the front clutch plate with the crankshaft key.
11. Slide the plate and pulley assembly in position on the crankshaft.
12. Install the retaining bolt, washer, and end cap and tighten securely.

Fig. 9-18 D-200 Installing PTO Clutch

13. Line up the clutch rod trunnion and clutch bars.
14. Attach the trunnion to the clutch bars and insert the washer and cotter pin to retain it.

Fig. 9-19 D-200 PTO Clutch Rod

15. Operate the clutch control lever and check the rear clutch plate and clutch bars for possible interference.
16. Adjust the clutch pivot hook in or out to eliminate any interference.

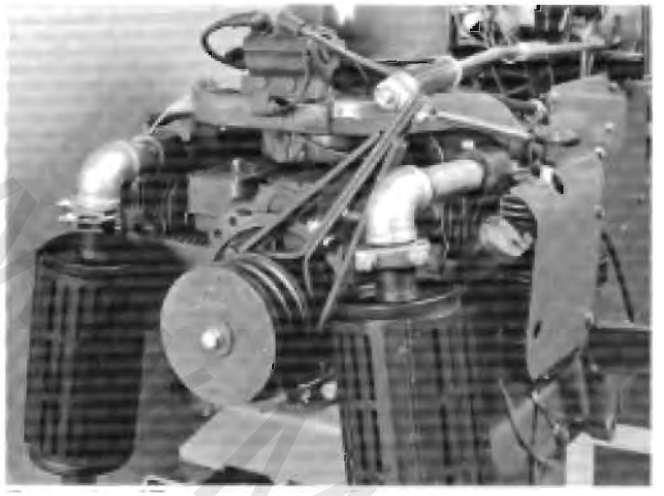


Fig. 9-20 D-200 PTO Clutch Assembled

17. Adjust PTO clutch and brake.

C-161 TWIN

PTO Adjustment — Same as C-Series

PTO Brake Adjustment — Same as C-Series

Remove PTO Clutch — Same as C-Series

PTO Thrust Bearing

The C-161 Twin is equipped with a thrust bearing between the engine and the drive pulley. The bearing *must* be preloaded, if the drive pulley is ever loosened or removed.

To preload the thrust bearing, assemble the PTO as described, and engage the PTO. Tighten the set screws in the drive pulley and disengage PTO.

NOTES