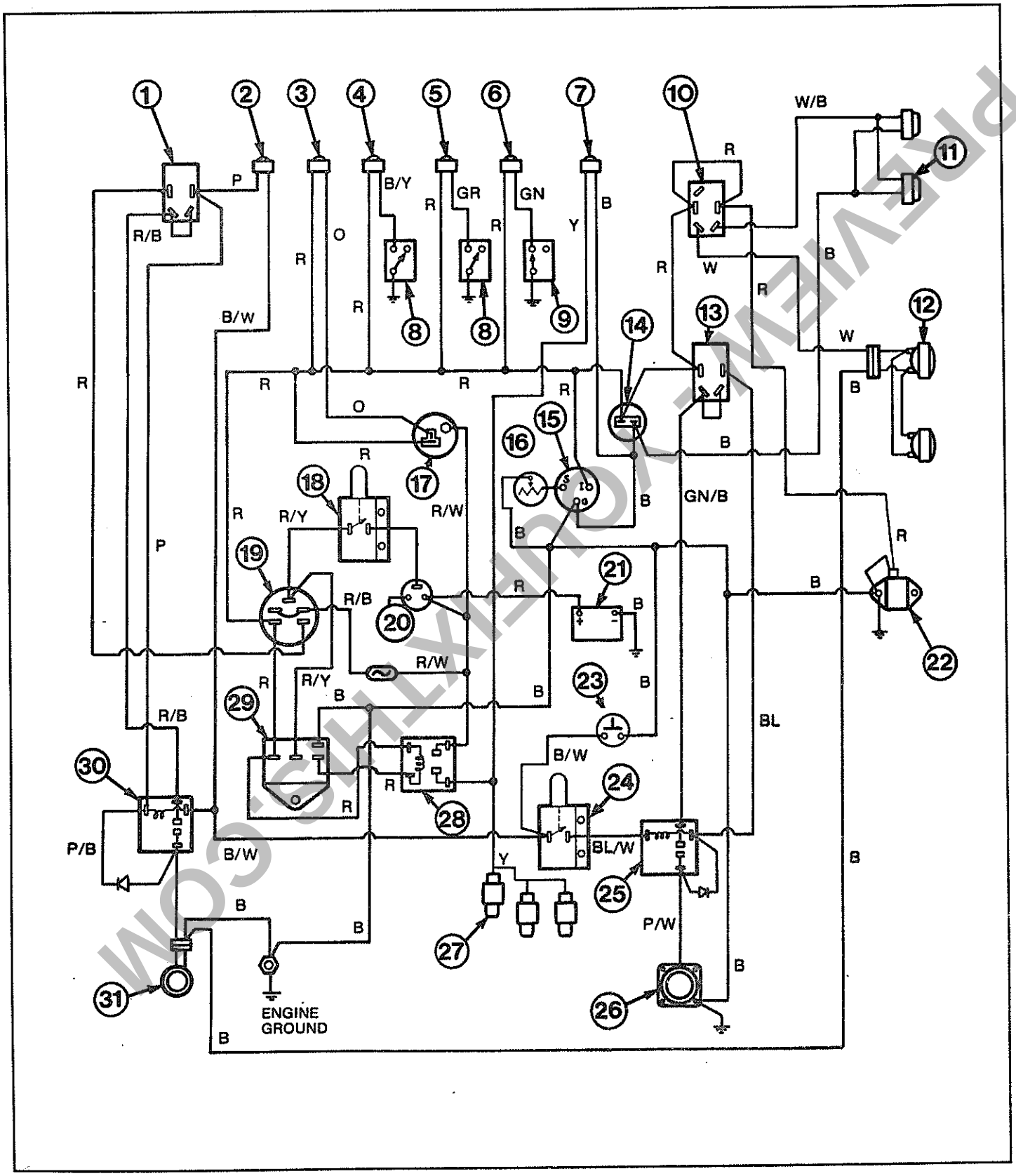
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ELECTRICAL SYSTEM (Continued)

COMPLETE WIRING DIAGRAM - MODEL 5117



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PRINCIPLES OF OPERATION

The hydraulic system is made up of seven major components. These are: the hydrostatic transmission charge pump, power steering control valve, power steering cylinder, attachment lift valve, attachment lift cylinder, filter and all external lines and hoses. The source of the fluid flow is a roller type charge pump mounted on the hydrostatic package, which is driven by the engine. This charge pump provides hydraulic pressure. The fluid reservoir is the transmission and final drive housing. All flow is first routed through the power steering control valve.

POWER STEERING CIRCUIT

The power steering control valve is a rotary valve with a built-in 'hand pump', which allows manual steering if hydraulic power is lost. A function of this valve is to give priority flow to the the power steering circuit (See Fig. 6-1 Power steering valve flow schematic). When the steering is in the neutral position, no fluid flow to the steering cylinder is required. In this position, all fluid flowing to the steering valve through the 'IN' port, immediately flows out through the 'AUX' port, and to the attachment lift valve. Also while in this position, the valve isolates the 'RH' and 'LH' work ports which are connected to the steering cylinder, so the steering linkage remains in a fixed position. When the steering wheel is turned, the valve is rotated to allow flow to be diverted to one side of the steering cylinder, and to allow return from the opposite side. When the steering wheel is turned in the opposite direction, the valve is indexed so the fluid flow is reversed, resulting in cylinder movement in the opposite

POWER STEERING VALVE FLOW SCHEMATIC

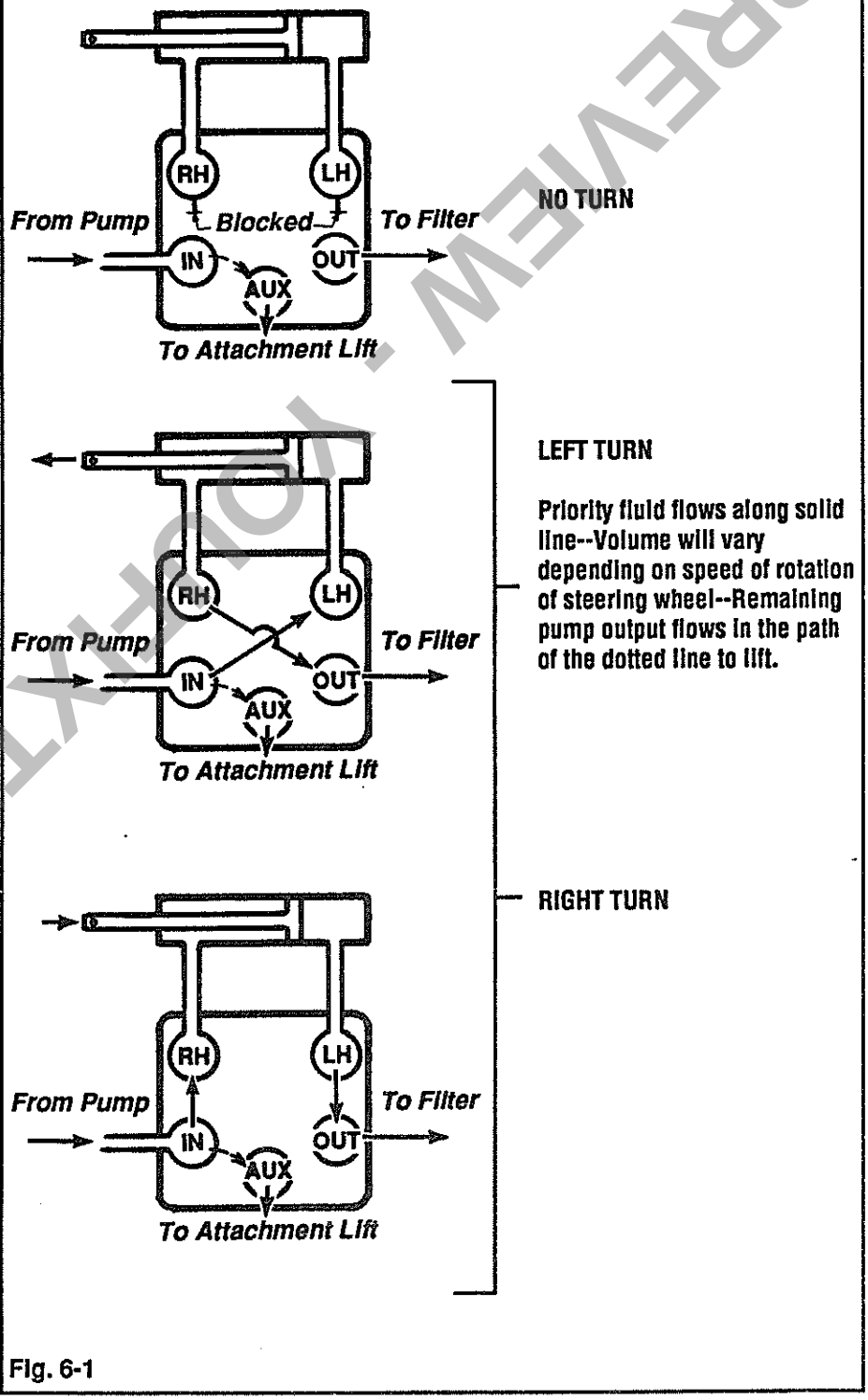
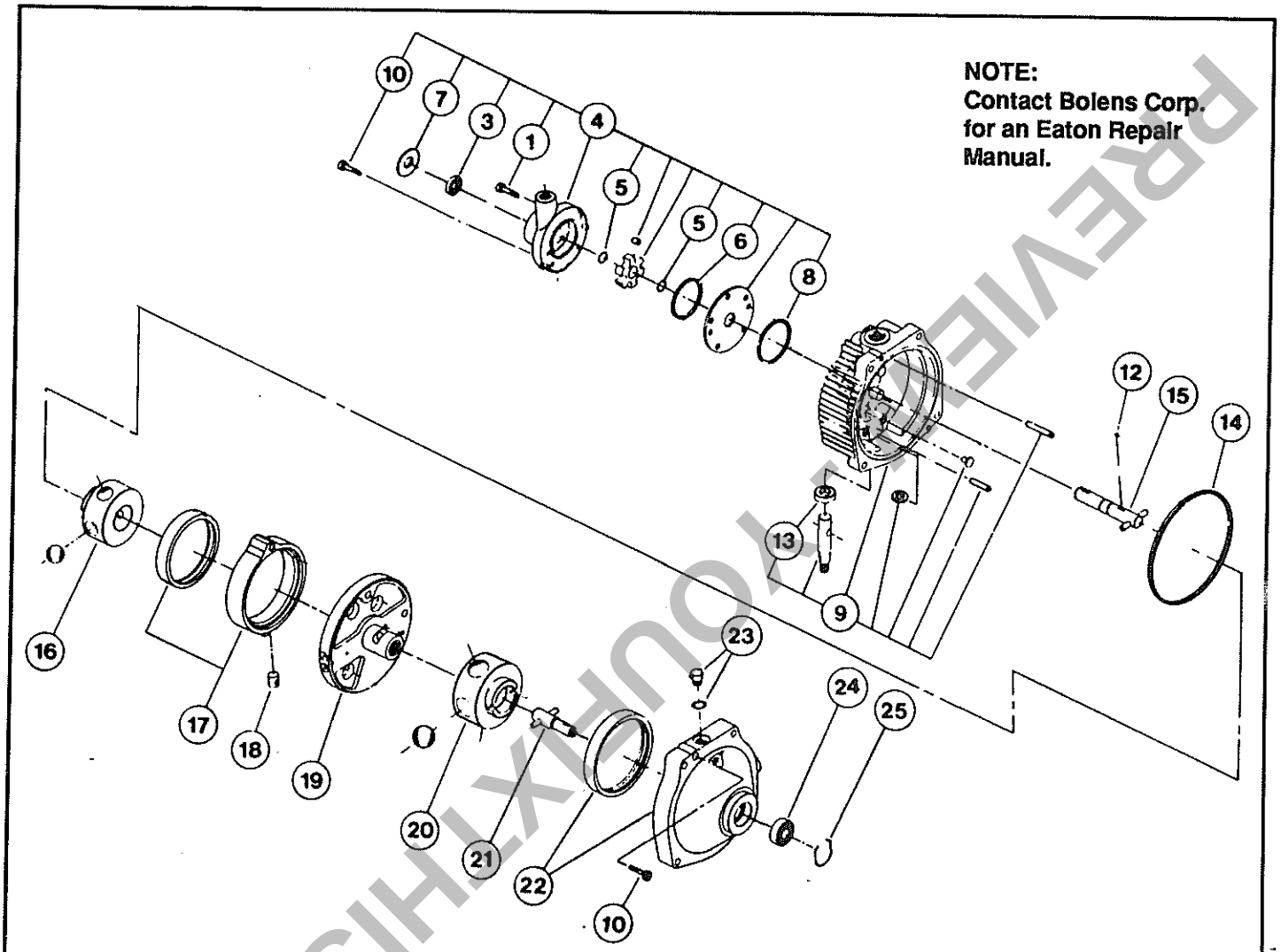


Fig. 6-1

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HYDROSTATIC BREAKDOWN



Ref #	Description	Qty.
1	Socket Screw 5/16-18 x 1-3/4 (Incl. w/Ref. 4.)	1
3	Oil Seal (Incl. w/Ref. 4)	1
4	Charge Pump Kit (Incl. Ref. 1,3,5,6,7,8,10 12)	1
5	Snap Ring (Incl. w/Ref. 4)	1
6	Sq. Seal Ring (Incl. w/Ref. 4)	1
7	Grass Shield (Incl. w/Ref. 4)	1
8	Sq. Seal Ring (Incl. w/Ref. 4)	1
9	Cover Sub Ass'y (Incl. w/Ref. 4)	1
10	Socket Hd. Screw 5/16-18 x 1-1/4 (Incl. w/Ref. 4)	1
12	Drive Pin (Incl. w/Ref. 4)	1
13	Oil Seal (Incl. w/Ref. 9)	1
14	Square Seal Ring	1
15	Input Shaft Sub Ass'y	1
16	Pump Rotor & Ball Ass'y	1
17	Cam Ring Ass'y	1
18	Cam Ring Insert	1
19	Pintle Ass'y (Incl. Internal Parts)	1
20	Motor Rotor & Ball Sub Ass'y	1
21	Output Shaft Sub Ass'y	
22	Body Ass'y (Incl. Ref. 21, 24 & 25)	1
23	O-Ring Plug Sub Ass'y	1
24	Ball Bearing (Output)	1
25	Retaining Ring	1

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TORQUE VALUES FOR CAP SCREWS

SIZE	SAE GRADE 2			SAE GRADE 5			SAE GRADE 8		
	Lb. In.	Nm	Kgm	Lb. In	Nm	Kgm	Lb. Ins	Nm	Kgm
1/4-20	49	5.5	0.6	75	8.5	0.9	108	12.2	1.2
1/4-28	56	6.3	0.6	86	9.7	1.0	120	13.6	1.4
	Lb. Ft.	Nm	Kgm	Lb. Ft.	Nm	Kgm	Lb. Ft.	Nm	Kgm
5/16-18	8	10.8	1.1	13	17.6	1.8	18	24.4	2.4
5/16-24	9	12.2	1.2	14	18.9	1.9	20	27.1	2.7
3/8-16	15	20.3	2.0	23	31.2	3.1	35	47.4	4.8
3/8-24	17	20.3	2.3	25	33.9	3.4	35	47.4	4.8
7/16-14	24	32.5	3.3	35	47.4	4.8	55	74.5	7.6
7/16-20	25	33.9	3.4	40	54.2	5.5	60	81.3	8.3
1/2-13	35	47.4	4.8	55	74.5	7.6	80	108.4	11.0
1/2-20	40	54.2	5.5	65	88.1	9.0	90	122.0	12.4
9/16-12	55	74.5	7.6	80	108.4	11.0	110	149.1	15.2
9/16-18	60	81.3	8.3	90	122.0	12.4	130	176.2	18.0
5/8-11	75	101.6	10.3	110	149.1	15.2	170	230.4	23.5
5/8-18	85	115.2	11.7	130	176.2	18.0	180	243.9	24.9
3/4-10	130	176.2	18.0	200	271.0	27.7	280	379.4	24.9
3/4-16	145	196.5	20.0	220	298.1	30.4	320	433.6	44.3
7/8-9	125	169.4	17.3	320	433.6	44.3	460	623.3	63.7
7/8-14	140	189.7	19.3	350	474.3	48.4	500	677.5	69.2
1-8	190	257.7	26.3	480	650.4	66.5	680	921.4	94.2
1-12	200	271.0	27.7	530	718.2	73.4	740	1002.7	102.5

Conversion Formula: To obtain Nm multiply ft. lbs. by 1.355.
To obtain Kgm multiply ft. lbs. by 0.138.

All torques ± 10% unless otherwise specified.
All torque values are for capscrews that have been lubricated with engine oil or grease.

Multiply Standard assembly torque by the following factors:

A. 1.25 when threads are dry
B. 0.85 when parts are plated
C. 0.75 when parts are parkerized
D. 0.70 when parts are coated with Molykote
E. 0.65 for jam nuts

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HYDROSTATIC REMOVAL & RE-INSTALLATION

HYDROSTATIC REMOVAL (Fig. 3-2, 3-3 & 3-4)

1. Remove any center or rear mount attachments and drain oil from the transaxle.

2. Remove four (4) bolts (A, Fig. 3-2) securing tunnel cover (B).

3. Loosen seat (C) at screws and knobs (D). Remove from seat support. Disconnect seat switch wires (E) and remove seat.

4. **(TWO SPEED MODELS)** Remove roll pin (F) from shift lever (G). Remove shift lever.

5. Remove the 2-5/16 Flange Nuts (G) securing rear of fender and the 2-5/16 Flange Bolts (H) securing front of fender. Pull seat switch wires through seat support and fender. Remove fuel cap and lift fender and seat support off.

6. Cut the tie straps holding wire harness to hydraulic tubes (note position of tie straps for assembly).

7. Loosen the six bolts (I, [3 on each side]) that hold the range light panel to the frame. Disconnect the wires from the fuel sending unit and slide the panel forward out of the way.

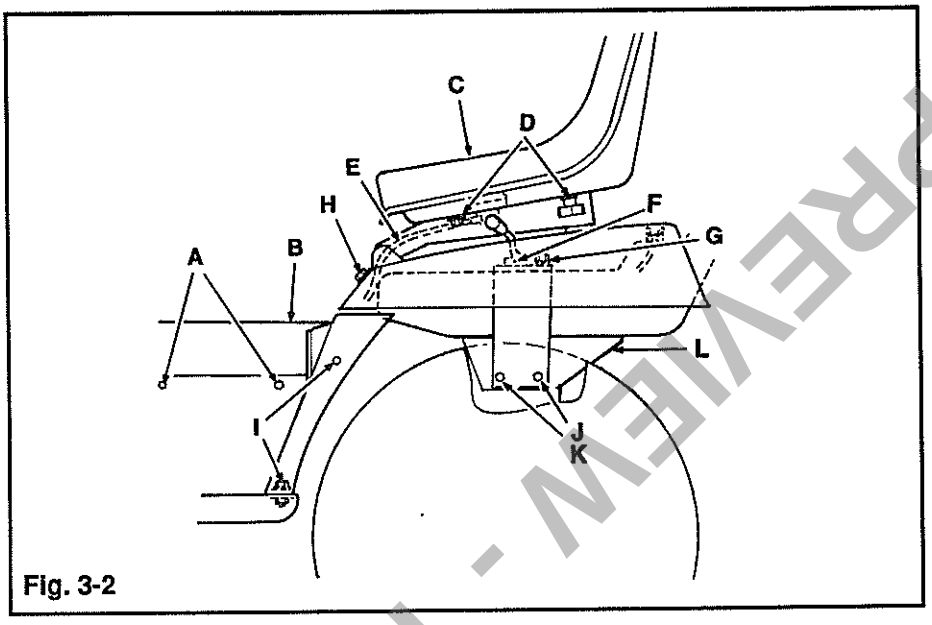


Fig. 3-2

8. Shut the fuel valve off and disconnect the fuel line. Some models are equipped with a clip that holds the line to the frame. Remove the clip–**Older Models** the fuel line is strapped to the frame. Cut the tie-straps (note position of tie-straps for re-assembly).

9. On the Left side of the tank, remove the two (2) lower 3/8 x 1 bolts and flange nuts (J, Fig. 3-2). On the right side, remove the lower two (2) 3/8 flange bolts (K) which are threaded into the rear axle housing (L). Remove fuel tank.

10. Loosen the 2 set screws securing engine driveshaft to transmission input shaft. Slide driveshaft all the way forward and let it rest on the rocker shaft.

11. Disconnect and remove suction line (A, Fig. 3-3) from bottom of hydro and rear axle, disconnect and remove return line from right side of hydro and filter base. Disconnect pressure line from TOP of hydro (it is not necessary to disconnect the other end of the line).

12. Remove nut and washer on control shaft and slide control arm assembly (B, Fig. 3-3) off of shaft. **NOTE:** A puller may be necessary when removing control arm.

13. Remove four (4) mounting bolts holding hydro to rear axle. It may be necessary to tap on hydro to break it loose from rear axle housing (Fig. 3-4).

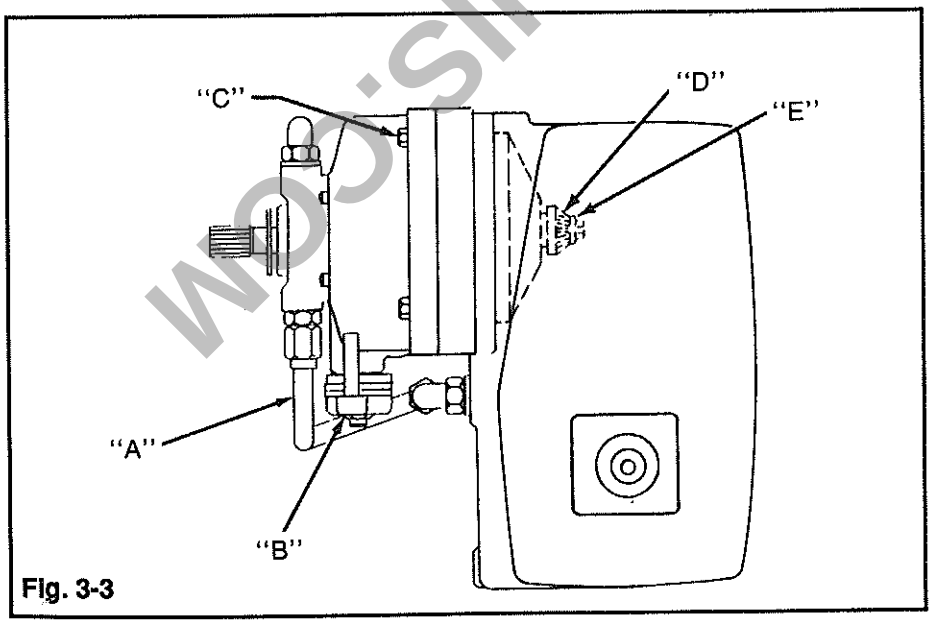


Fig. 3-3

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TROUBLE SHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	REMEDY
Starter Motor does not energize and solenoid does not click.	1. Attachment drive engaged. 2. Brake pedal not depressed. 3. Corroded or loose electrical solenoid connections. 4. Inoperative switches--Attachment drive, brake and key switch. 5. Inoperative solenoid.	1. Disengage Attachment Drive Switch. 2. Depress brake pedal. 3. Clean and tighten Connection at solenoid. 4. Check and replace if necessary. (Refer to switch testing.) 5. Check and replace if necessary. (Refer to solenoid testing.)
Starter Motor does not energize but solenoid clicks.	1. Discharged battery. 2. Corroded or loose electrical connections at battery. 3. Defective solenoid or Starter.	1. Charge battery. 2. Clean & Tighten Connections. 3. Check and replace as necessary.
Engine cranks slowly.	1. Weak or discharged battery. 2. Corroded or loose electrical connections at battery.	1. Check battery, charge or replace if necessary. 2. Clean and tighten.
Battery discharges.	1. Low water level. 2. Defective battery.	1. Check and refill. 2. Check and replace as necessary.
Battery will not charge.	1. Corroded or loose battery cables. 2. Defective battery. 3. Inoperative rectifier/regulator.	1. Clean and tighten. 2. Replace battery. 3. Refer to Engine Manual for test Procedure.

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GENERAL (Continued)

SPECIFICATIONS

Bolens reserves the right to make changes in specification, add improvements or discontinue the manufactured product at any time without notice or obligation.

Illustrations in this manual may not relate exactly to the finished product due to product improvements and running changes.

ENGINE	MODEL 5117H
Manufacturer	Mitsubishi
Model/Spec	L3A-61BG
Type	4 cycle, Water Cooled Diesel
Cylinders	3
Bore and Stroke	2.56" (65 mm) x 2.76" (70 mm)
Piston Displacement	42.48 cu. in. (700 cc)
Firing Order	1-3-2
Fuel Injection Pressure	2000 P.S.I.
Mfr's H.P. Rating	17 H.P at 3600 R.P.M.
Air Cleaner	Paper Element
Oil Capacity	3.8 U.S. Qt. (4.2 liters) w/filter
Governor	Mechanical
Speed Control	Remote, Cable Operated
Starter	Solenoid Shift
Glow Plugs	Sheathed type
Charging System	12V,35 Amp. Alternator
Engine Speed	IDLE-1800 R.P.M. HIGH-3600 R.P.M.
Timing	Shim Injection Pump
Fuel Injection System	Bosch Type
Fuel Transfer Pump	Electric

ENGINE	MODEL 5118H, 5118HS
Manufacturer	Kohler
Model/Spec	M18QS
Type	Horiz. shaft, air cooled 2 cyl., 4 cycle
Bore and Stroke	3.12" (79.4mm) x 2.75" (69.8 mm)
Piston Displacement	42.18 cu. in. (690 cc)
Mfr's H.P. Rating	18 H.P at 3600 R.P.M.
Air Cleaner	Paper Element with Pre-cleaner
Oil Capacity	1.5 U.S. Qts. (1.7 liter) 1.75 U.S. Qts. (1.9 liter) w/filter
Governor	Mechanical
Speed Control	Remote, Cable Operated
Starter	Bendix Type
Charging System	15 Amp. flywheel Alternator
Engine Speed	IDLE-1200 R.P.M. HIGH-3600 R.P.M.
Spark Plug Size	14 mm
Spark Plug	Champion RV15YC
Spark Plug Gap	.025 (0.63 mm)
Ignition	Electronic

ENGINE	MODEL 5120H
Manufacturer	Kohler
Model/Spec	M20QS
Type	Horiz. shaft, air cooled 2 cyl., 4 cycle
Bore and Stroke	3.12" (79.4mm) x 3.06 (77.7 mm)
Piston Displacement	46.98 cu. in. (769 cc)
Mfr's H.P. Rating	20 H.P at 3600 R.P.M.
Air Cleaner	Paper Element with Pre-cleaner
Oil Capacity	1.5 U.S. Qts. (1.7 liter) 1.75 U.S. Qts. (1.9 liter) w/filter
Governor	Mechanical
Speed Control	Remote, Cable Operated
Starter	Bendix Type
Charging System	15 Amp. flywheel Alternator
Engine Speed	IDLE-1200 R.P.M. HIGH-3600 R.P.M.
Spark Plug Size	14 mm
Spark Plug	Champion RV15YC
Spark Plug Gap	.025 (0.63 mm)
Ignition	Electronic

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MAINTENANCE CHART
MODELS 5118H, 5118HS & 5120H

DAILY	Engine (Refer to engine manual, "MAINTENANCE PROCEDURES")	As Required
	Cooling Fins (Engine)	Clean
	Transmission Cooling Fins	Clean
	Transmission Oil	Check
	Engine Oil Level	Check
	Engine Cooling Air Screen	Brush Clean
	Tires	Check for wear and Air pressure
First 5 Hrs. to 50 Hrs.	Engine Air Cleaner	Clean Pre-Cleaner Shake out Dirt
	Engine Oil and Filter	Change
	Valve Clearance	Adjust
	Brake	Check for wear and Adjustment
	Engine idle	Adjust
	Transmission Oil Filter	Change--Add Oil to Operating Level
	Battery	Check water level Add as Required
	Belts	Check for wear
Every 100 Hrs.	Engine Oil	Change
	Oil Filter	Replace
	Transmission Oil and Filter	Change
	Air Precleaner Filter	Check
	Spark Plugs	Replace
	Transmission Oil Filter	Replace
	Engine Air Cleaner	Replace Element
	Attachment Drive Clutch	Check and Adjust Clearance
	Fuel filter	Replace
Every 400 Hrs.	Valve Clearance	Adjust**
	Engine idle	Adjust**
	Starter	Inspect**

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*More often under extreme conditions.

**Refer to engine manual for technical specifications.

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MOWER DECKS

MOWER LEVELING

For best cutting results, it is important that the mower be leveled correctly.

1. Check tractor tire pressure:

   Front: 12 to 14 PSI (14 PSI with front mounted attachments).
   Rear: 10 to 12 PSI

2. Place mower on a level, flat surface.

3. Lower mower to the ground.

(42" & 48" MOWERS, Models 51042S, 51048S & 51048R)

4. Measure mower blade tip height front and rear. Front of blade should be even with rear (A, Fig. 8-1). If not, adjust rod length of front links (C). Lengthen rods to lower front and shorten rods to raise front.

5. Raise and lower the mower attachment using the lift system a couple of times. Re-check leveling.

(60" MOWER, Model 51060S)

NOTE: 60" mowers equipped with 4 gauge wheels do not have leveling adjustments. When all four gauge wheels are on a level surface, and the pins are in the same position, the mower will be level.

4. Measure mower blade tip height front and rear. Front of blade should be even with rear. If not, adjust rod length of front links (D, Fig. 8-2). Lengthen rods to lower front and shorten rods to raise front.

5. Raise and lower the mower attachment using the lift system a couple of times. Re-check leveling.

NOTE: 60" mowers do not have a side-to-side leveling adjustment.

SIDE-TO-SIDE LEVELING (42" & 48" MOWERS

If side to side leveling is required, an adjustment is provided at the rear left gage wheel. Adjust by loosening screws (A, Fig. 8-3) and either lowering or raising "L" rod (B).

42" & 48" MOWERS

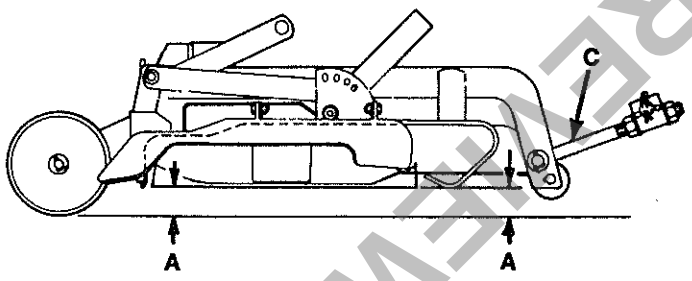


Fig. 8-1

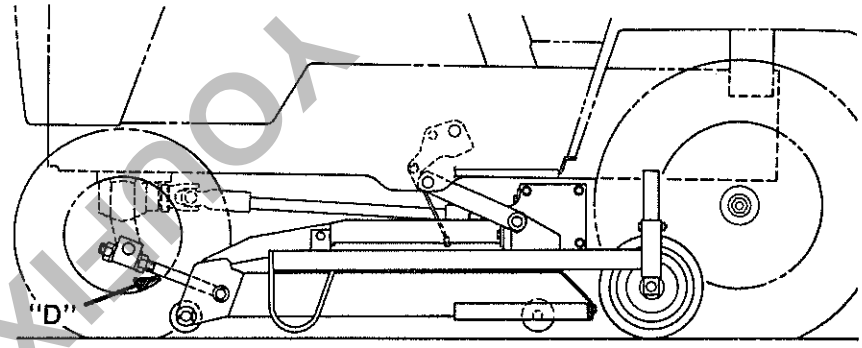


Fig. 8-2

LUBRICATION

There are three grease fittings on the mower; one on top of each blade spindle. Lubricate the grease fittings after every 100 hours or annually with multi-purpose grease.

Frequently lubricate the linkage, rollers and other pivot points with a few drops of lubricating oil, especially after washing the mower.

(42" & 48" MOWERS)

The gear case is filled at the factory with 11oz. of EP 90 gear lube. Remove plug at rear of gear case, check oil level. Oil should be to the level of the plug opening. check oil every 25 hours of operation.

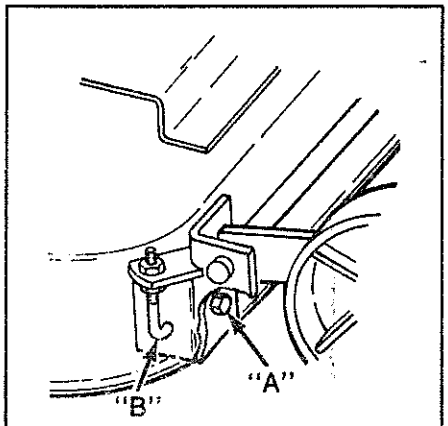


Fig. 8-3

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FUEL SYSTEM (Continued)

SERVICING
GASOLINE ENGINES

TYPICAL FUEL FLOW DIAGRAM

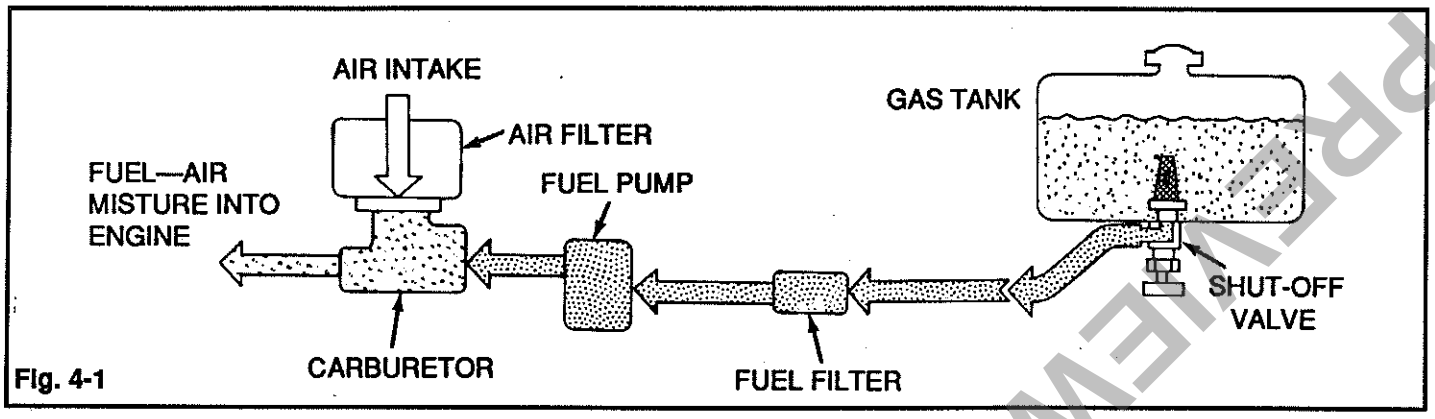


Fig. 4-1

FUEL TANK

Fill with a good, clean, fresh grade of unleaded gasoline

CAUTION

DO NOT MIX OIL WITH GASOLINE. REFUEL OUTDOORS. DO NOT REFUEL WHILE ENGINE IS RUNNING. ALLOW ENGINE TO COOL BEFORE REFUELING.

Check to see that vent hole in fuel tank cap is not plugged.

FUEL VALVE

The fuel valve is located under the fuel tank. This valve must be fully open for proper operation of the tractor.

FUEL FILTER (Fig 4-2)

The fuel filter (A) is a disposable type in-line filter. It should be replaced when dirty. To replace, first shut off in-line valve under fuel tank, then remove filter from the fuel line.

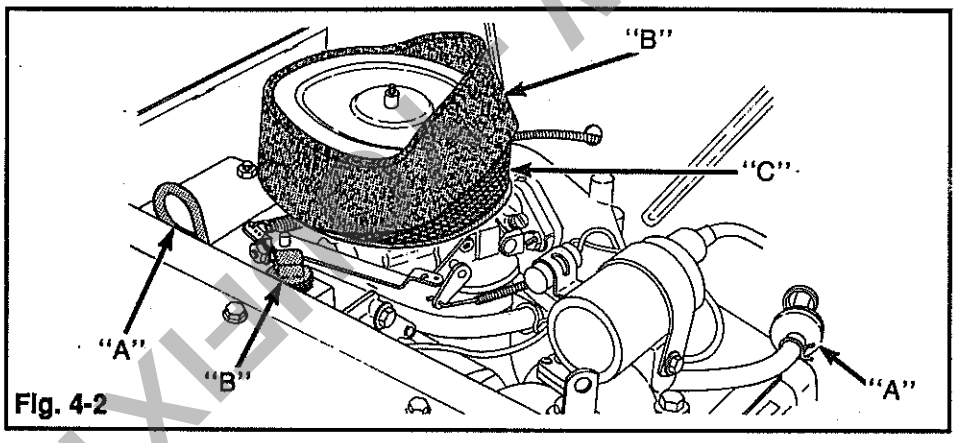


Fig. 4-2

Replace with Bolens part number 1727491.

AIR CLEANER

THE IMPORTANCE OF PROPER AIR CLEANER MAINTENANCE CANNOT BE OVER-EMPHASIZED!

IMPROPER AIR CLEANER MAINTENANCE CAN CREATE ENGINE DAMAGE WHICH THE ENGINE MANUFACTURER WILL NOT WARRANT!

AIR CLEANER DISASSEMBLY

1. Clean off any dirt or debris from around the air cleaner.

2. Remove air cleaner cover.

3. Remove pre-cleaner (B), Figure 4-2 and paper element (C).

PRE-CLEANER

Service pre-cleaner every 25 hours or more often under extremely dirty or dusty conditions.

Remove foam pre-cleaner by sliding it off the paper cartridge.

Wash foam pre-cleaner in liquid detergent and water.

Wrap foam pre-cleaner in cloth and squeeze dry.

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