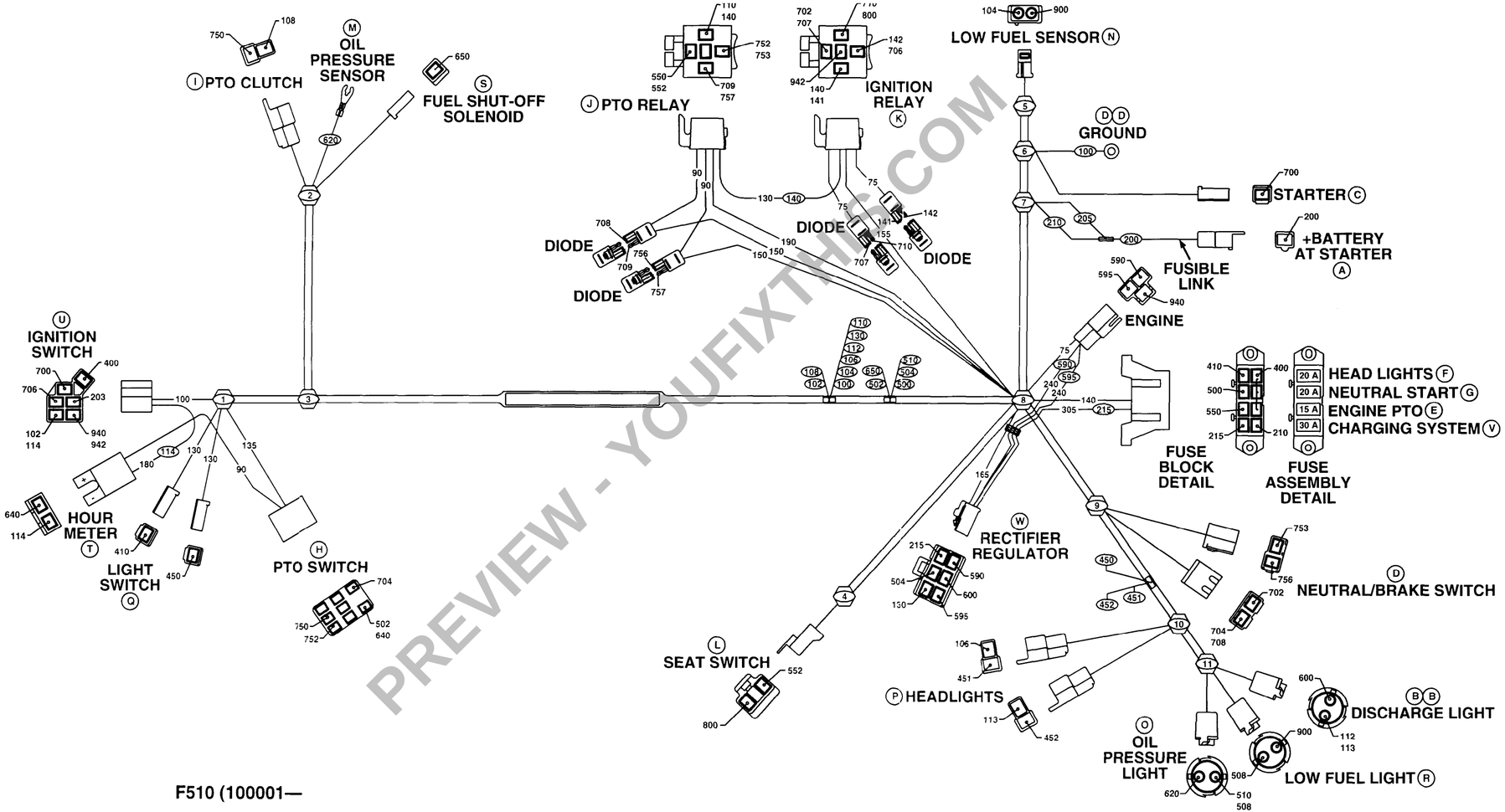
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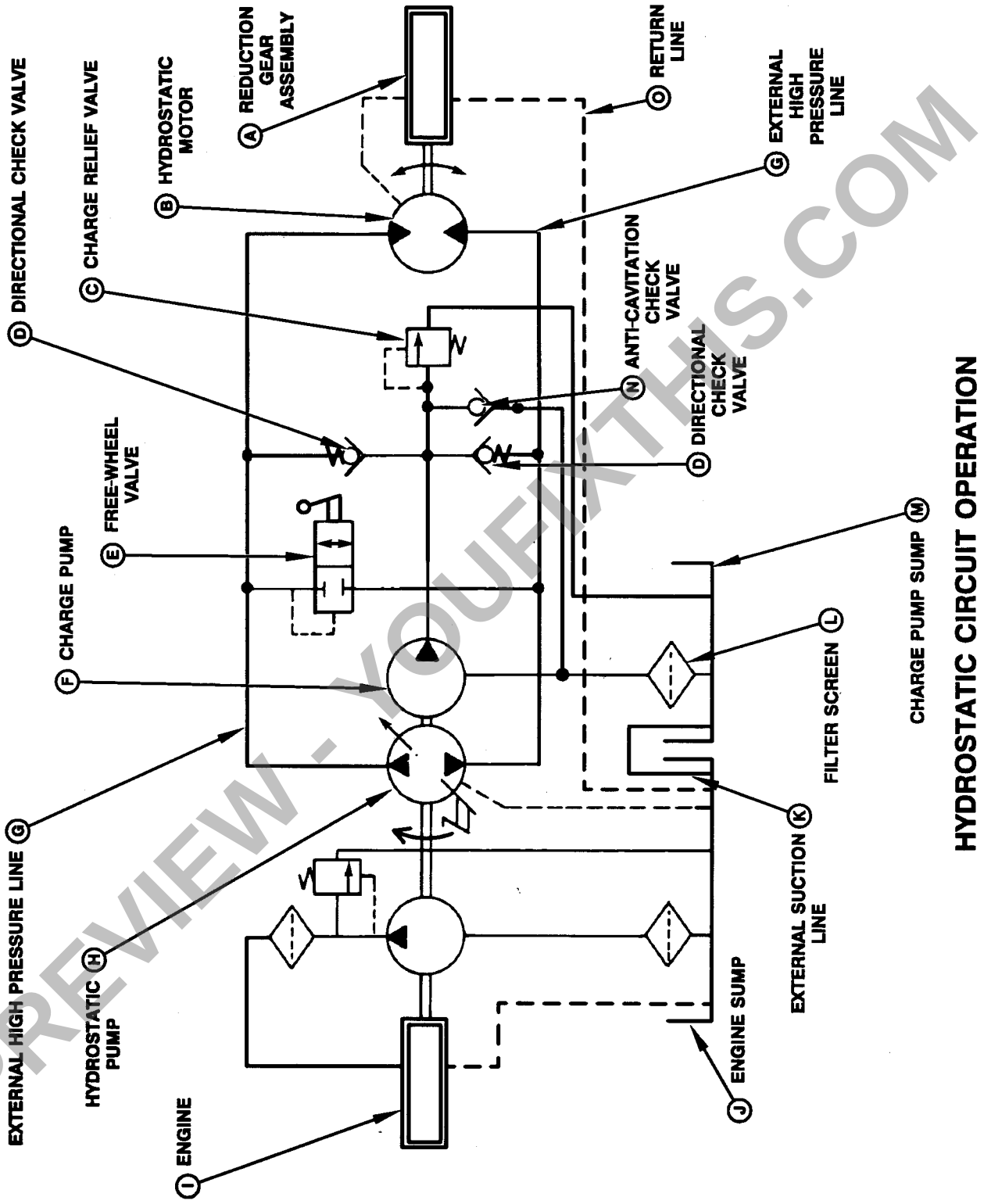
CIR NUM	WIRE SIZE mm²	COLOR
100	2.0	blk
102	1.0	blk
104	1.0	blk
106	0.8	blk
108	1.0	blk
110	1.0	blk
112	0.8	blk
113	0.8	blk
114	0.8	blk
130	2.0	blk
140	1.0	blk
141	1.0	blk
142	1.0	blk/wht
200	1.0	red
205	3.0	red
210	3.0	red
215	2.0	red
400	3.0	yel/red
410	1.0	yel/blk
450	1.0	yel/wht
451	0.8	yel/wht
452	0.8	yel/wht
500	2.0	yel
502	1.0	yel/red
504	1.0	yel
508	0.8	yel
510	0.8	yel
550	1.0	yel
552	1.0	yel
590	3.0	brn/yel
595	3.0	brn/wht
600	0.8	brn
620	0.8	tan
640	0.8	yel
650	1.0	pnk/blk
700	1.0	pur
702	1.0	pur
704	1.0	pur
706	1.0	pur/blk
707	0.5	pur
708	1.0	pur/wht
709	0.8	pur or pur/wht
710	1.0	pur/wht
750	1.0	blu
752	1.0	blu/wht
753	1.0	blu
756	1.0	blu/wht
757	0.8	pur or pur/wht
800	1.0	pnk
900	0.8	blk/wht
940	1.0	wht
942	1.0	wht/blk



F510 (100001—

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DISASSEMBLE AND ASSEMBLE RECIPROCATING BALANCER

1. Remove collar (A), gear (G), key (F), and spacer (H).

2. Remove rods (B) and crankshaft (I).

3. Inspect crankshaft. (See Remove, Inspect and Install Crankshaft in this group.)

4. Inspect balancer assembly. (See Inspect Balancer Assembly in this group.)

5. Put a light film of oil on bearing surfaces.

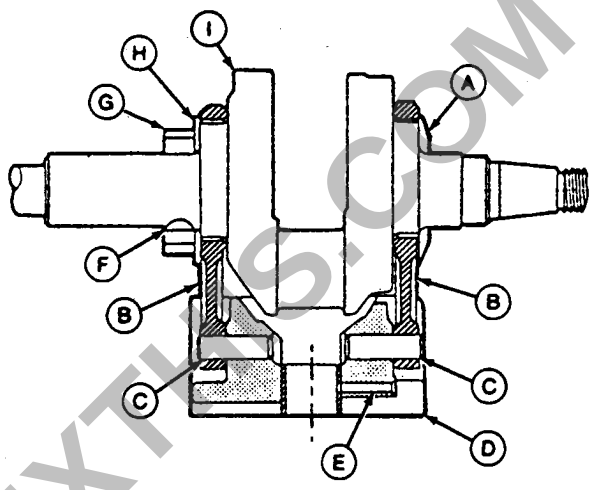
NOTE: Oil grooves of link rods (B) must face away from crankwebs.

6. Install balance weight to crankshaft with balancer bushing oil passage (E), facing flywheel side (upward).

7. Install collar (A).

8. Install spacer (H) with chamfered I.D. face toward link rod.

9. Install key and crank gear.



M51759 -UN-07SEP88

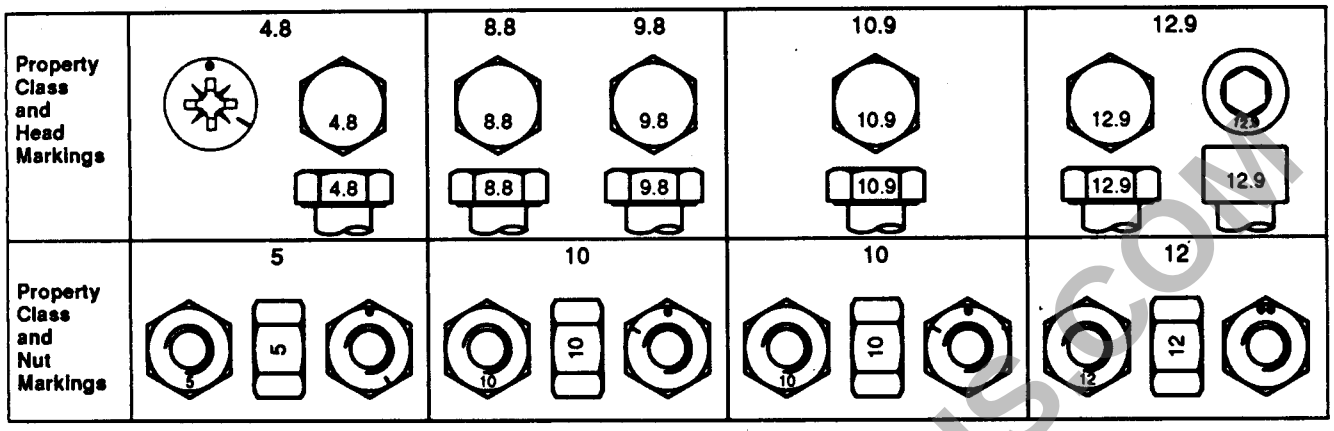
A—Collar
B—Link Rod
C—Wrist Pin
D—Balance Weight
E—Oil Passage
F—Woodruff Key
G—Crank Gear
H—Spacer
I—Crankshaft

MX,2020CL,A12 -19-23OCT95

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METRIC BOLT AND CAP SCREW TORQUE VALUES



TS1163 -19-04MAR91

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

DX,TORQ2 -19-20JUL94

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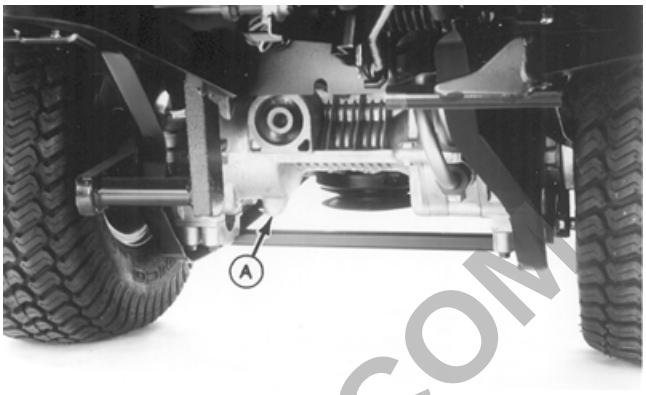
REMOVE ENGINE

1. Disconnect battery cables. (Disconnect negative cable at engine first.)

2. Remove mower deck.

NOTE: Oil reservoir capacity is approximately 3.4 L (3.5 qt).

3. Remove drain plug (A) and drain oil reservoir.



-UN-23MAY95
M81636

MX,2005CL,A1 -19-23OCT95

4. Remove front wheels. (See Remove and Install Wheels in Section 60, Group 10.)

5. Remove snap ring (A). Remove mower deck arms.

6. Remove seat platform (B). (See Remove and Install Seat Platform in Section 80, Group 15.)

7. Remove fenders. (See Right Fender—Service Removal and Left Fender Replacement in Section 80, Group 15.)

8. Close fuel shut-off valve (C).

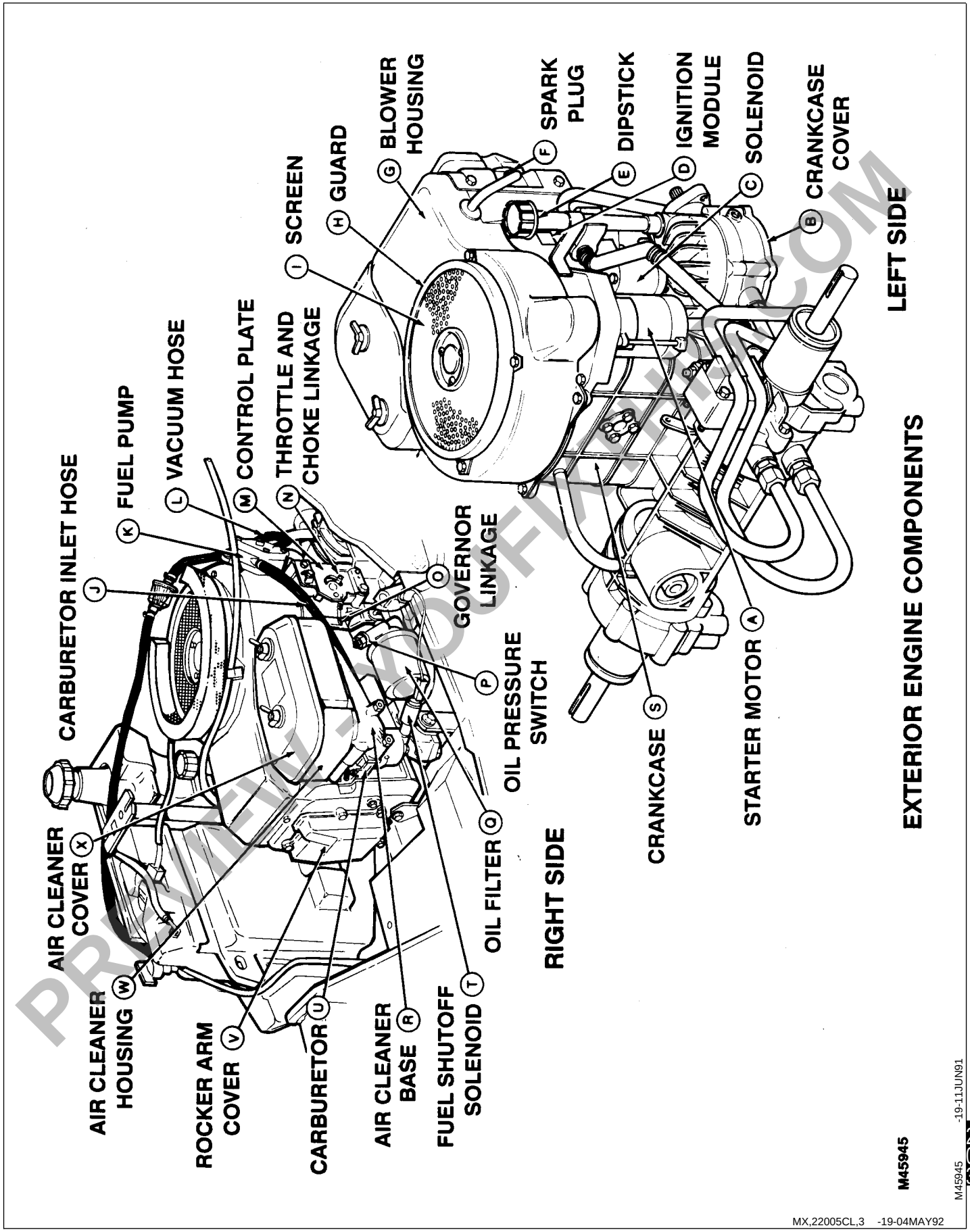


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MX,22005CL,3 -19-04MAY92

220
05
3

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DIAGNOSTIC INFORMATION

The diagnostic information in this group is used to test components related to a specific problem. Select the appropriate symptom from the list that best matches your problem and follow the test procedures under that heading. The symptom headings are:

- Engine cranks but will not start
- Engine flooding
- Lack of fuel in carburetor
- Engine starts hard or stops when hot
- Engine surging
- Engine backfires through carburetor
- Engine backfires through muffler when shut OFF
- Engine misses
- Engine loses power or runs rough when hot
- Engine has black exhaust smoke
- Engine has blue exhaust smoke or oil in air cleaner
- Engine uses too much oil

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “NORMAL” column gives the specification or condition that should be obtained when performing the test or check. If the results are not normal, perform the test, check, or adjustment listed in the third “IF NOT NORMAL” column to repair the malfunction. The detailed tests or adjustments referred to in the “IF NOT NORMAL” column are located at the end of this group.

The system diagram that accompanies each test procedure shows the machine components. The key number on the art matches the number in the “TEST LOCATION” column and the arrow shows the exact point where the test is to be made.

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MACHINE SPECIFICATIONS

	F510	F525
ENGINE	PA420A	PA540A
Manufacturer	KHI	KHI
Cycle	4	4
Output	10.4 kW (14 hp)	12.7 kW (17 hp)
Displacement	423 cc (25.8 cu. in.)	535 cc (32.64 cu. in.)
Cylinders	1	1
Crankshaft Alignment	Vertical	Vertical
Bore	89 mm (3.5 in.)	89 mm (3.5 in.)
Stroke	68 mm (2.68 in.)	86 mm (3.38 in.)
Speed, fast (no load)	3250 ±50 rpm	3250 ±50 rpm
Speed, idle (no load)	1450 rpm	1450 rpm
Ignition	Solid state	Solid state
Starter	Electric	Electric
Cooling	Air	Air
Unitized Eng/Trans		
Oil Reservoir Capacity:		
Without filter	2.4 L (2.5 qt)	2.6 L (2.7 qt)
With filter	2.6 L (2.7 qt)	2.8 L (2.9 qt)
Total system	3.4 L (3.5 qt)	3.9 L (4.1 qt)
Air Cleaner	Dry Replaceable w/foam precleaner	Dry Replaceable w/foam precleaner
POWER TAKE-OFF	Electric	Electric
CONSTRUCTION		
Block	Aluminum	Aluminum
Cylinder Liner	Cast iron	Cast iron
Cylinder Head	Aluminum	Aluminum
ELECTRICAL SYSTEM		
Charging System	Flywheel Alternator; 13 AMP, Regulated	Flywheel Alternator; 15 AMP, Regulated
Battery Voltage	12	12
Reserve Capacity @ 25 Amp	35 minutes	35 minutes
Cold Cranking Amp @ -18˚C (0˚F)	255	255
Spark Plug	RN11YC or NGK-BPR5ES	RN11YC or NGK-BPR5ES
Plug Gap	0.7-0.8 mm (0.28-0.031 in.)	0.7-0.8 mm (0.28-0.31 in.)
FUEL SYSTEM		
Fuel Tank Location	Left side	Left side
Capacity	10.4 L (2.75 U.S. gal)	10.4 L (2.75 U.S. gal)
Fuel Type	Unleaded Gasoline	Unleaded Gasoline
DRIVE TRAIN		
Transmission Type	Hydrostatic	Hydrostatic
Manufacturer	KHI	KHI
No. of Speeds	Infinite	Infinite
Travel Speeds		
Forward (Max)	8 km/h (5 MPH)	8 km/h (5 MPH)
Reverse (Max)	4 km/h (2.5 MPH)	4 km/h (2.5 MPH)

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TUNE-UP ADJUSTMENTS

1. Clean engine cooling fins.
2. Clean or replace air filter.
3. Replace fuel filter.
4. Check electrolyte level.
5. Clean, regap or replace spark plug.
6. Check charging system output.
7. Check engine compression.
8. Adjust carburetor and throttle linkage.
9. Adjust governor.
10. Check and clean crankcase breather.
11. Check crankcase vacuum.
12. Adjust brake.
13. Check transaxle and steering linkage.
14. Check tire pressure.

MX,1015CL,10 -19-23OCT95

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RECOGNIZE SAFETY INFORMATION

This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



T81389 -UN-07DEC88

DX,ALERT -19-03MAR93

UNDERSTAND SIGNAL WORDS

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.



TS187 -19-30SEP88

DX,SIGNAL -19-03MAR93

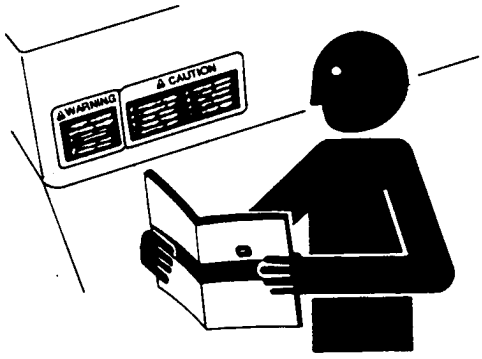
FOLLOW SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.



TS201 -UN-23AUG88

DX,READ -19-03MAR93

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Continued on next page

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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ENGINE CONFIGURATION CHART

The PA420A and PA540A engines have an engine configuration number following the engine model number to help separate engine changes. Use the engine configuration number to determine the proper service specifications and procedures to follow in this technical manual.

ENGINE CONFIGURATION CHART

F510 (Engine S.N. -3887)	PA420A-AS00
(Engine S.N. 3888-4898)	PA420A-BS00
(Engine S.N. 4899-7322)	PA420A-AS01
(Engine S.N. 7323-)	PA420A-AS02
F525 (Engine S.N. -7891)	PA540A-AS00
(Engine S.N. 7892-11999)	PA540A-BS00
(Engine S.N. 12000-21944)	PA540A-AS01
(Engine S.N. 21945-)	PA540A-AS02

MX,1015CL,1 -19-23OCT95

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JOHN DEERE DEALERS

This is a complete revision for TM1475—F510 and F525 Residential Front Mowers.

Discard TM1475 dated (01MAY92) and replace with this manual.

New information added to this manual includes:

1. Updated engine repair procedures and specifications.
2. New engine adjustment procedures.
3. New electrical wiring harness diagrams.
4. New electrical schematics and diagnostic diagrams.
5. Updated electrical tests.
6. New mower deck repair procedures.
7. New lift linkage repair procedures.
8. New snowthrower repair information.
9. New snowthrower diagnostic information.
10. New snowthrower adjustment procedures.
11. New Power Flow™ repair information.
12. New Power Flow™ diagnostic information.

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TM1475,DPS -19-23OCT95

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Pre-ignition is the igniting of the fuel-air mixture prior to regular ignition spark. Pre-ignition causes internal shock, resulting in pings, vibration, detonation and power loss. Severe damage to piston (A), rings and valves results from pre-ignition.

Check the following for causes of pre-ignition:

- Internal carbon deposits.
- Incorrect spark plug (high heat range).
- Broken ceramic in spark plug.
- Sharp edges on valves.



-UN-06SEP88
M30039

MX,2110BV,53 -19-01OCT92

Check rod and piston alignment when piston shows a diagonal wear pattern (A) extending across the skirt of the piston. Contact with the cylinder wall shows on bottom of skirt at left and ring lands on the right.

A cylinder bored at an angle to the crankshaft can also cause improper ring contact with the cylinder.

This condition causes:

- Rapid piston wear.
- Uneven piston wear.
- Excessive oil consumption.



-UN-06SEP88
M29948

MX,2110BV,54 -19-01OCT92

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INSTALL STEERING SHAFT AND GEARS

1. Install gear assembly.

2. Install bracket (E) on frame.

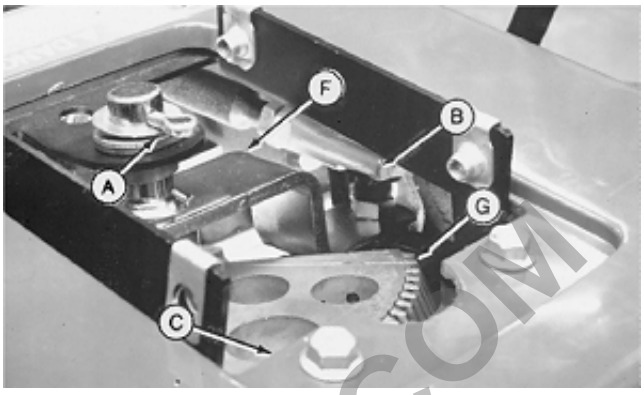
3. Adjust cap screw (D) for proper spring tension.

4. Attach foot rest (C).

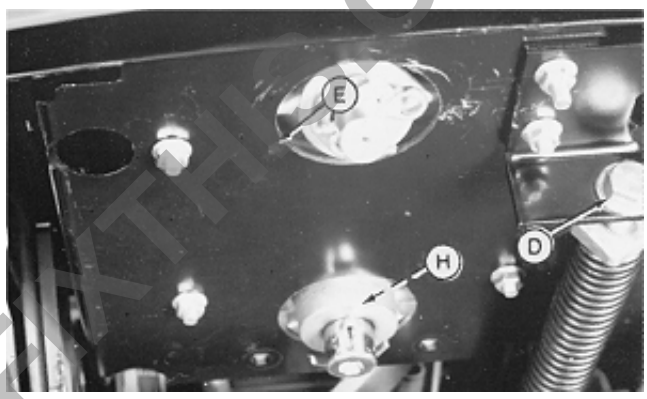
5. Connect drag link (B). Tighten ball joint to steering arm nut to **37 N·m (27 lb-ft)**.

6. Install bushing (A) and cotter pin.

A—Bushing
B—Drag Link
C—Foot Rest
D—Cap Screw
E—Bracket
F—Steering Arm
G—Sector Gear
H—Bushing



-UN-13APR89
M53084

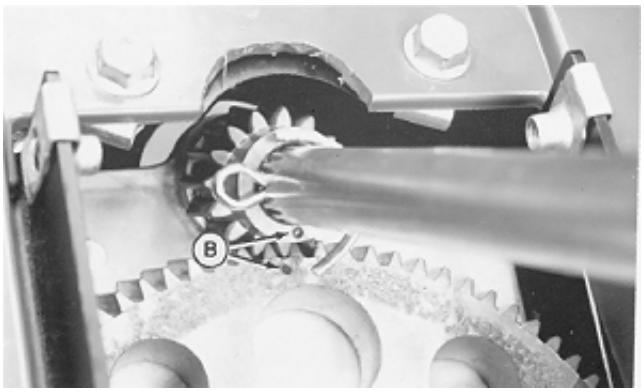


-UN-13APR89
M53085

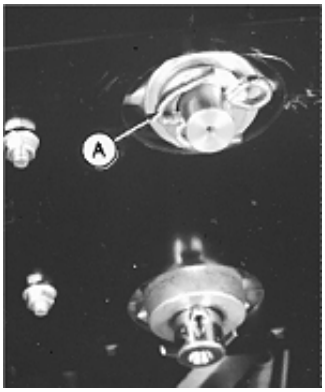
MX,6005CL,A6 -19-23OCT95

7. Install shaft assembly. Align marks (B) on gears. With marks aligned, sector shaft arm should be at 90˚ left.

8. Install washers and cotter pin (A).



-UN-13APR89
M53054



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M53052

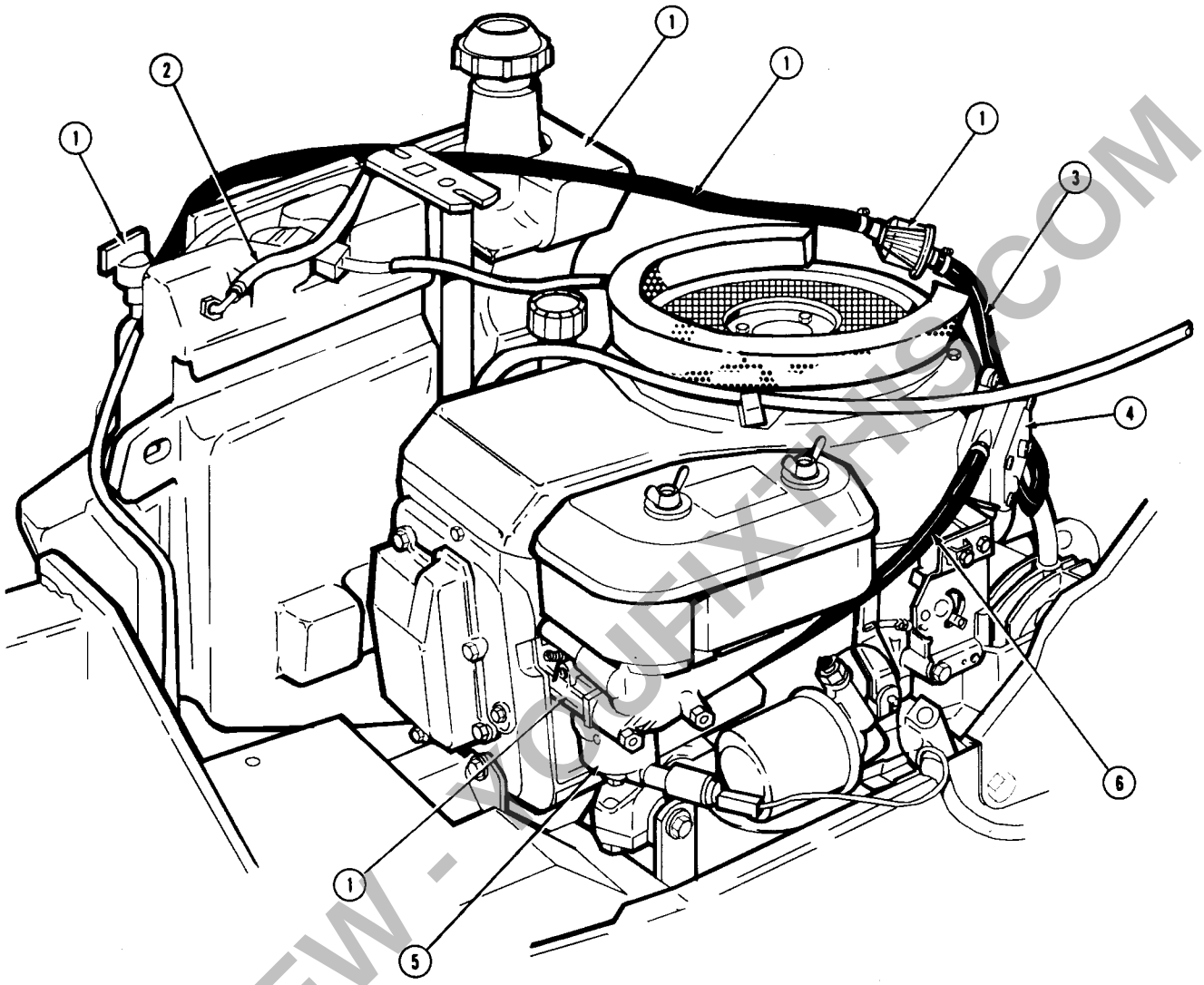
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M45928

LACK OF FUEL IN CARBURETOR.

-19-11JUN91

M45928

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SLOW AND FAST IDLE CIRCUIT OPERATION

A—Choke Valve
B—Throttle Valve (Slow Idle)
C—Throttle Valve (Fast Idle)
D—Slow Idle Mixture Screw Passage
E—Transition Passages
F—Pilot Air Jet
G—Pressurized Fuel
H—Air
I—Fuel/Air Mixture
J—Venturi
K—Main Jet
L—Pilot Jet Passage
M—Pilot Jet
N—Slow Idle Mixture Screw
O—Slow Idle Stop Screw

Function:
Supply the correct fuel/air mixture to the engine during no load conditions at both slow and fast idle.

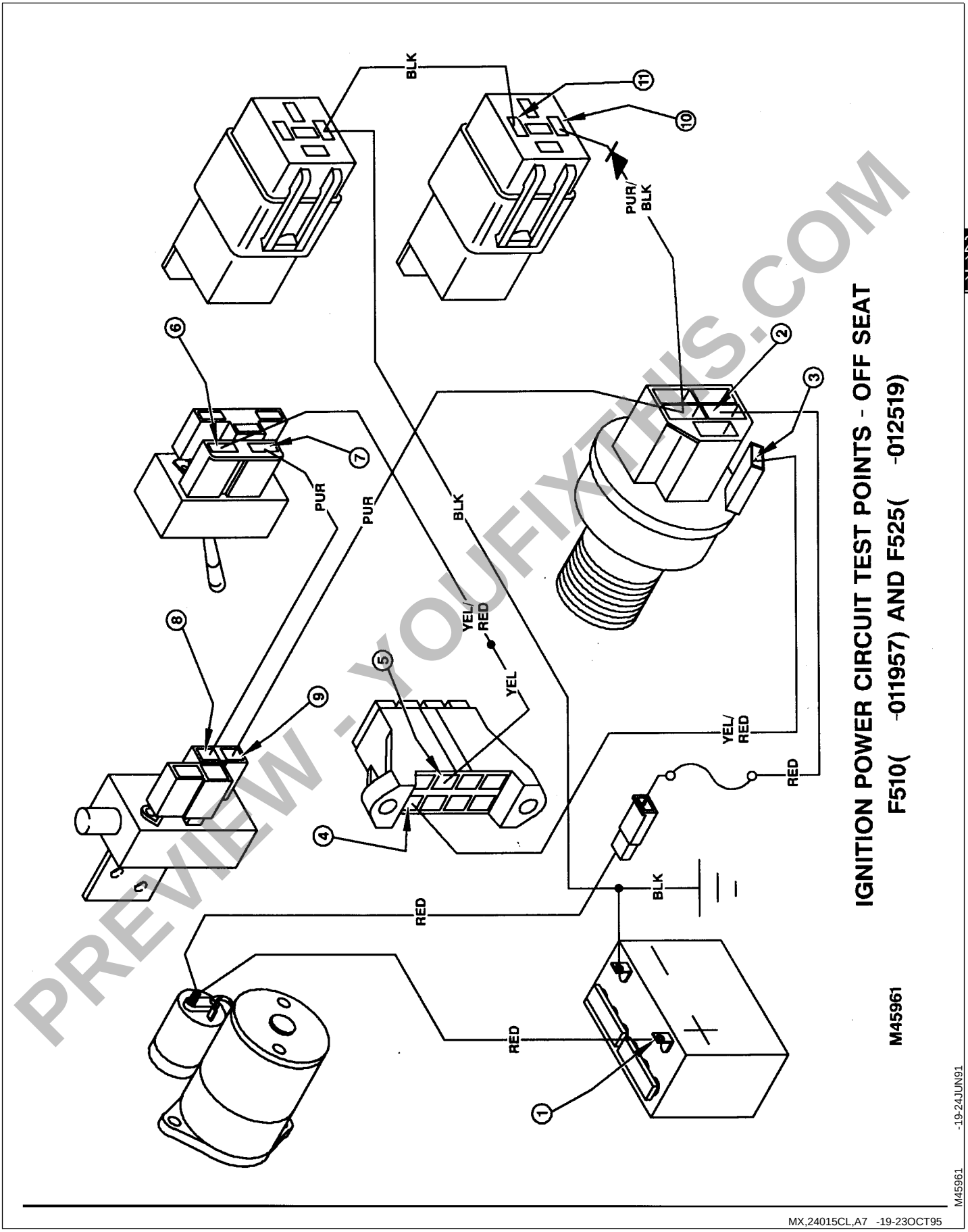
Major Components:
- Pilot Jet
- Pilot Air Jet
- Slow Idle Passage
- Slow Idle Mixture Screw
- Transition Passages

Theory of Operation:
The slow and fast idle circuits of this engine are of a fixed-jet design. The pilot jet (M) is not adjustable but can be changed for various conditions. There is also a pilot air jet (F) that meters a small amount of air (H) that is mixed with the fuel (G) at the pilot jet. The amount of this fuel/air mixture (I) that is drawn into the engine at slow idle can be adjusted by the slow idle mixture screw (N). This makes it possible to get the best fuel/air ratio for slow idle speeds. The slow idle stop screw (O) is used to adjust the slow-idle rpm of the engine. The pilot jet will have some control over the amount of fuel drawn into the engine at fast idle. At slow idle, the throttle valve (B) is almost closed. There is not enough air flow through the venturi (J) to draw fuel from the main jet (K) circuit. The only fuel/air drawn in will be through the slow idle mixture screw passage (D). When the engine is run at fast idle, the throttle valve (B) opens a little more to fast idle position (C). There is still not enough air flow to draw fuel through the main jet circuit, but more fuel/air mixture is required. This additional fuel/air mixture is supplied by transition passages (E). These passages begin supplying the fuel/air mixture as the edge of the throttle valve pass them. They also help supply fuel/air during the transition from a no-load to a load condition.

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M45961 -19-24JUN91

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ADJUST SPARK PLUG GAP



M48365 -UN-25OCT89

Reason:
To maintain the correct gap between the center electrode and the tab needed to produce a good spark.

Equipment:
• 0.76 mm (0.030 in.) feeler gauge

Procedure:

240
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IMPORTANT: Do not clean spark plug with sandpaper or abrasives. Engine scoring can result.

1. Put transmission in **neutral**.

2. Turn key switch to **OFF** position.

3. Raise and lock seat platform.

4. Raise rear shroud.

5. Disconnect spark plug cap.

6. Scrape or wire brush deposits from spark plug.

7. Inspect spark plug for:
   —Cracked porcelain
   —Pitted or damaged electrodes.

8. Check spark plug gap (A) using a feeler gauge. Set gap to **0.76 mm (0.030 in.)**.

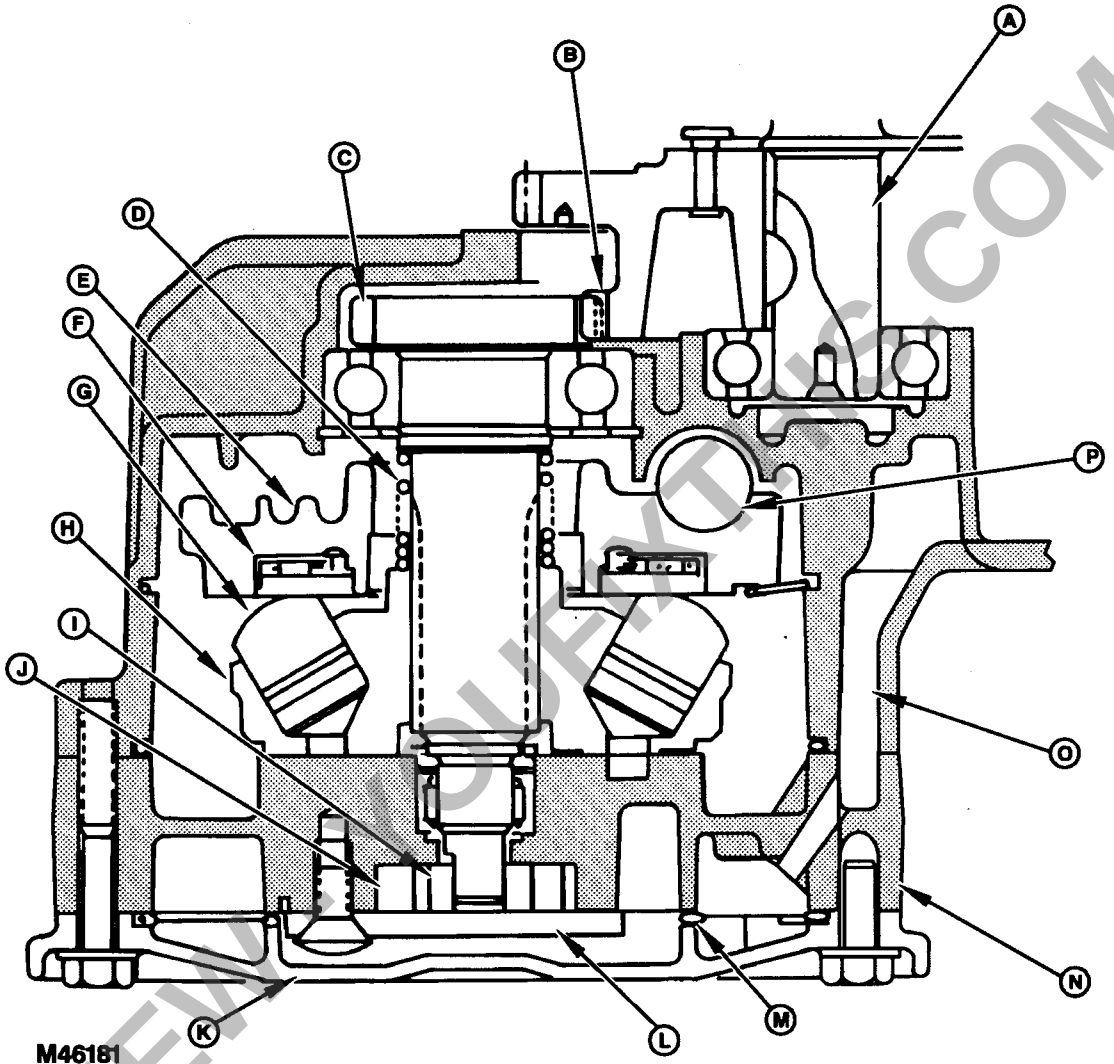
9. Install and tighten spark plug to **25 N·m (18 lb-ft)**.

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HYDROSTATIC PUMP COMPONENTS-PA420A/PA540A-AS01 AND AS02



A—Engine Camshaft
B—Camshaft Pump Drive Gear
C—Pump Driven Gear
D—Spring
E—Swash Plate
F—Needle Thrust Bearing
G—Piston
H—Cylinder Block
I—Inner Charge Pump Rotor
J—Outer Charge Pump Rotor
K—Pump Cover
L—Charge Pump Plate
M—Charge Pump Screen
N—Pump Housing
O—Internal Oil Passage
P—Swash Plate Pivot Ball

M46181 -UN-27APR92

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