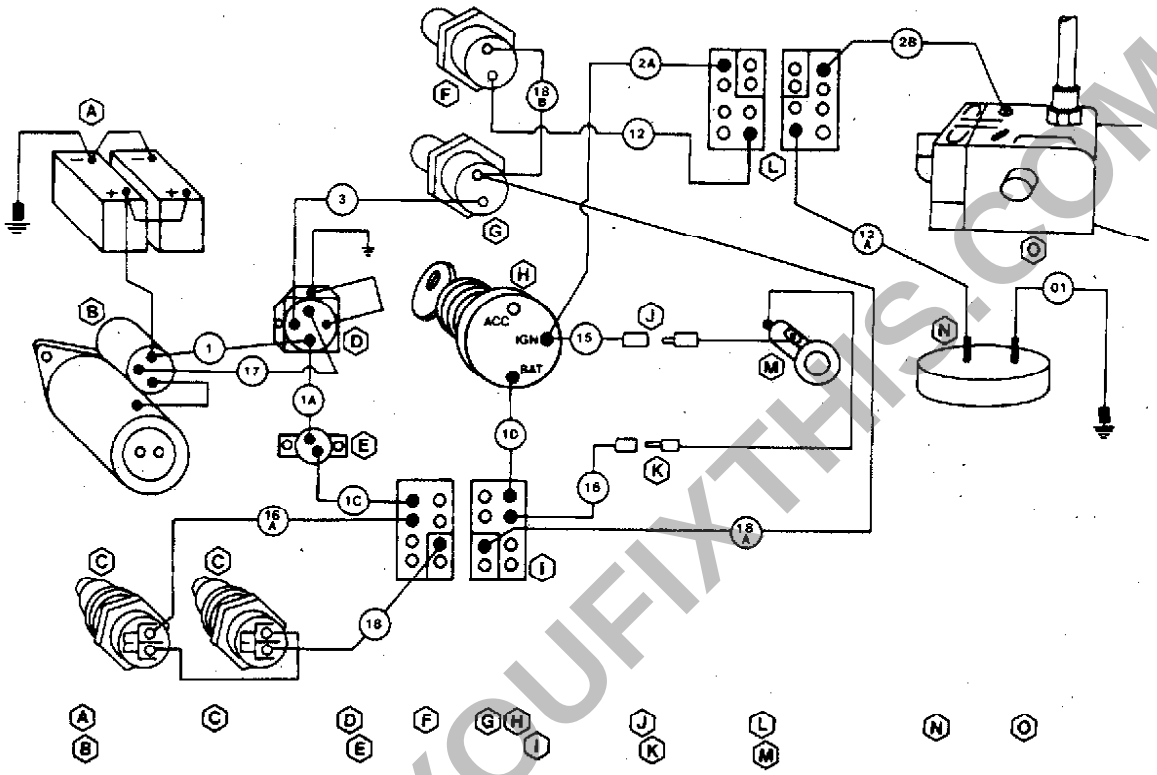
STARTING CIRCUIT OPERATION



T6793AU -UN-17OCT88

A—Batteries
B—Starter Solenoid
C—Neutral Start Switch
D—Starter Relay
E—Circuit Breaker
F—Starter Aid Switch
G—Start Button
H—Key Switch
I—Red Connector
J—Bullet Connector
K—Bullet Connector
L—Black Connector
M—Start Fuse
N—Start Aid Solenoid
O—Fuel Shut-Off Solenoid

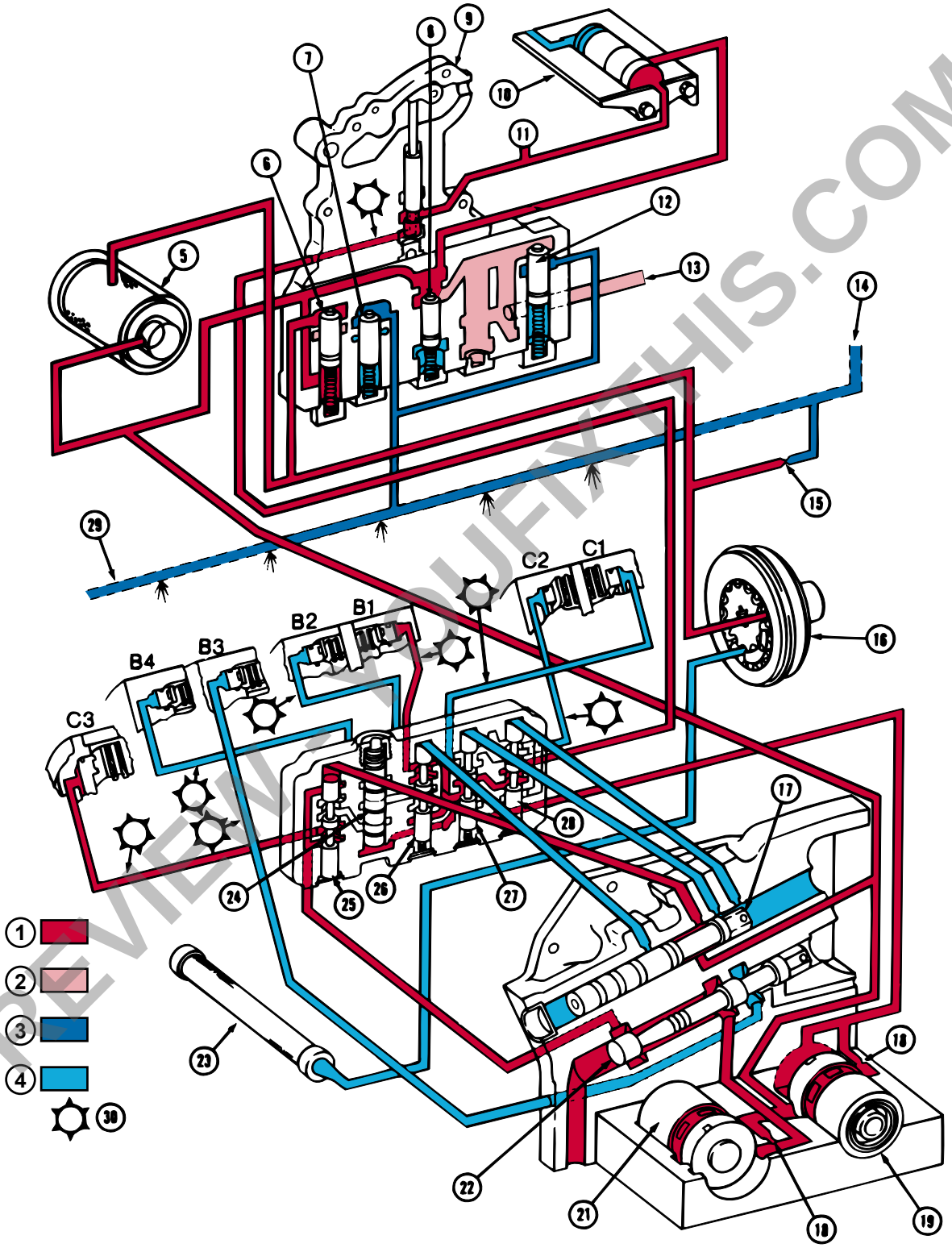
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TRANSMISSION HYDRAULIC SYSTEM OPERATION



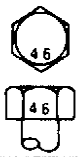
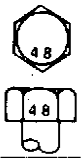
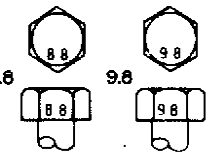
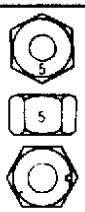
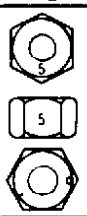
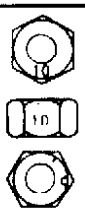
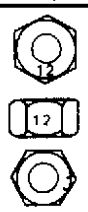
T6523EI -UN-

T59,9020,177 -19-16MAY88

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METRIC CAP SCREW TORQUE VALUES

Property Class and Head Markings	4.6 	4.8 	8.8 9.8 	10.9 	12.9 
Property Class and Nut Markings	5 	5 	10 	10 	12 

DIA.	WRENCH SIZE	4.6 OIL N•m(lb-ft)	4.6 DRY N•m(lb-ft)	4.8 OIL N•m(lb-ft)	4.8 DRY N•m(lb-ft)	8.8 or 9.8 OIL N•m(lb-ft)	8.8 or 9.8 DRY N•m(lb-ft)	10.9 OIL N•m(lb-ft)	10.9 DRY N•m(lb-ft)	12.9 OIL N•m(lb-ft)	12.9 DRY N•m(lb-ft)
M3	5.5mm	0.4(0.2)	0.5(0.3)	0.5(0.4)	0.7(0.5)	1(0.8)	1.3(1)	1.5(1)	2(1.5)	1.5(1)	2(1.5)
M4	7mm	0.9(0.6)	1.1(0.8)	1(0.9)	1.5(1)	2.5(1.5)	3(2)	3.5(2.5)	4.5(3)	4(3)	5(4)
M5	8mm	1.5(1)	2.5(1.5)	2.5(1.5)	3(2)	4.5(3.5)	6(4.5)	6.5(4.5)	9(6.5)	7.5(5.5)	10(7.5)
M6	10mm	3(2)	4(3)	4(3)	5.5(4)	7.5(5.5)	10(7.5)	11(8)	15(11)	13(9.5)	18(13)
M8	13mm	7(5)	9.5(7)	10(7.5)	13(10)	18(13)	25(18)	25(18)	35(26)	30(22)	45(33)
M10	16mm	14(10)	19(14)	20(15)	25(18)	35(26)	50(37)	55(41)	75(55)	65(48)	85(63)
M12	18mm	25(18)	35(26)	35(26)	45(33)	65(48)	85(63)	95(70)	130(97)	110(81)	150(111)
M14	21mm	40(30)	50(37)	55(41)	75(55)	100(74)	140(103)	150(111)	205(151)	175(129)	240(177)
M16	24mm	60(44)	80(59)	85(63)	115(85)	160(118)	215(159)	235(173)	315(232)	275(203)	370(273)
M18	27mm	80(59)	110(81)	115(85)	160(118)	225(166)	305(225)	320(236)	435(321)	375(277)	510(376)
M20	30mm	115(85)	160(118)	165(122)	225(166)	320(236)	435(321)	455(356)	620(457)	535(395)	725(535)
M22	33mm	160(118)	215(159)	225(167)	305(225)	435(321)	590(435)	620(457)	840(620)	725(535)	985(726)
M24	36mm	200(148)	275(203)	285(210)	390(288)	555(409)	750(553)	790(583)	1070(789)	925(682)	1255(926)
M27	41mm	295(218)	400(295)	415(306)	565(417)	810(597)	1100(811)	1155(852)	1565(1154)	1350(996)	1835(1353)
M30	46mm	400(295)	545(402)	565(417)	770(568)	1100(811)	1495(1103)	1570(1158)	2130(1571)	1835(1353)	2490(1837)
M33	51mm	545(402)	740(546)	770(568)	1050(774)	1500(1106)	2035(1500)	2135(1575)	2900(2139)	2500(1844)	3390(2500)
M36	55mm	700(516)	950(700)	990(730)	1345(992)	1925(1420)	2610(1925)	2740(2021)	3720(2744)	3205(2364)	4355(3212)

TS298 -19-09AUG89

CAUTION: Use only metric tools on metric hardware. Other tools may not fit properly. They may slip and cause injury.

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

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

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

Make sure fastener threads are clean and 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 amount shown in chart. Tighten toothed or serrated-type lock nuts to full torque value.

O53,TORQ2 -19-26JAN90

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OPERATIONAL CHECKOUT PROCEDURE

Use this operational checkout procedure to check all systems and functions on the skidder. This checkout procedure and functions on the skidder. This checkout procedure is designed so the technician can make a quick check of the operation of the skidder while sitting in the operator's seat. The entire procedure can be done in less than 25 minutes when the hydraulic and transmission oil is at operating temperature.

A location is required which has the following: level area, a slope, a tree, or immovable object to connect the winch line to for winch tests, logs for grapple checks and has adequate space to complete the driving checks. No special tools are required to remove the cover from the shift quadrant for transmission drag checks and a 2 1/4 in. socket or wrench is required to loosen the dampener hex nuts when performing grapple rotate diagnosing performance checks. If necessary refer to diagnosing malfunctions charts, test, or adjustment section of the technical manual when a problem is indicated or verification is needed while performing the checkout procedure.

Complete the necessary visual checks (oil levels, oil condition, external leaks, loose hardware, linkage, wiring and etc.) prior to doing the checkout procedure.

T59,9005,113 -19-17JUL90

1. Dash Gauges, Indicators (including Secondary Steering—if equipped) Hourmeter and Park Brake Indicator Checks With Engine Off.

ACTION: Gauges and Indicators Checks
a. Engage park brake. (Move lever forward)
b. Place transmission control lever in neutral (center position).
c. Turn steering wheel to bleed all pressure in steering system to zero.
d. Turn key switch to "On" position.

LOOK: The red indicator lights for engine oil pressure, alternator, park brake, transmission oil pressure and secondary steering light must be on.

LOOK: Hour meter indicator must turn every few seconds.

LOOK: Observe water temperature and fuel gauges for later reference.

LISTEN: The alarm for the secondary steering (if equipped) must be sounding while steering.

NOTE: If any gauge pointers go immediately to full scale deflection, a short is indicated in the circuit. See Section 9015 Group 15.

ACTION: Park Brake Alarm Check
a. Key switch on.
b. Shift transmission control lever to neutral forward or neutral reverse.

LISTEN: Park brake buzzer must sound.

ACTION: Air Cleaner Restriction Indicator Check

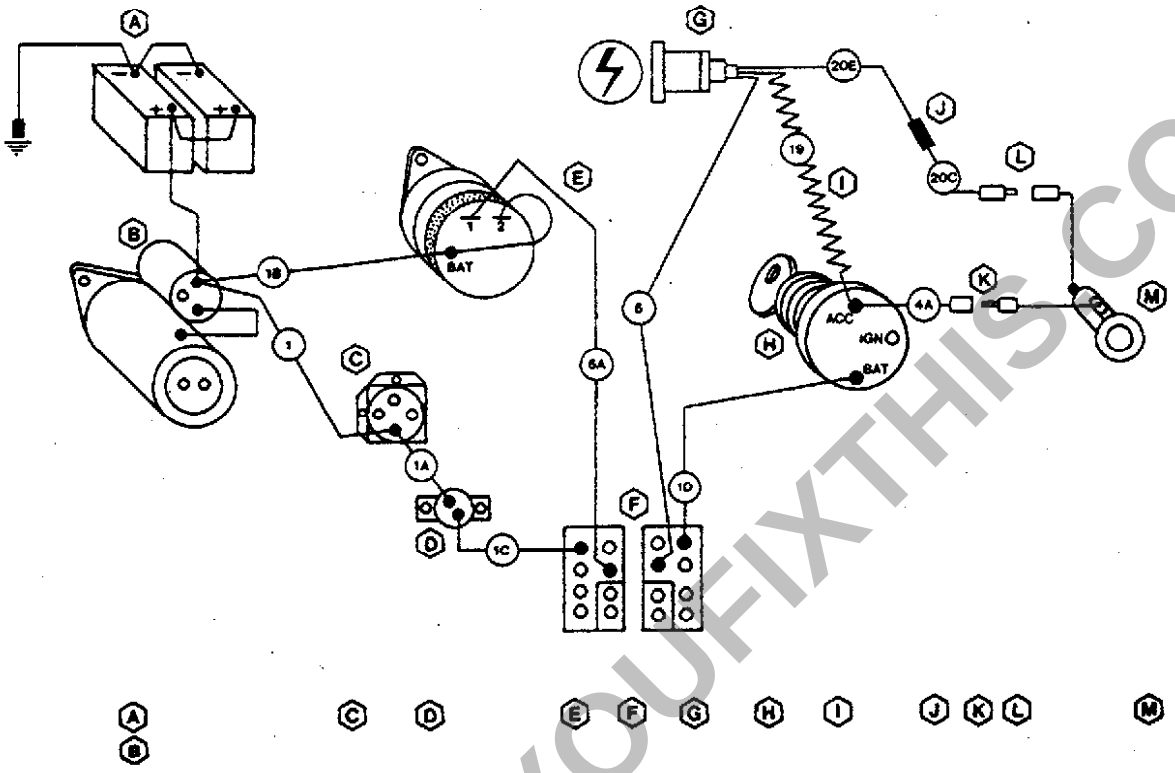
Open right side shield and observe air restriction indicator on air cleaner outlet tube.

LOOK: Air restriction indicator must NOT show red.

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CHARGING CIRCUIT OPERATION



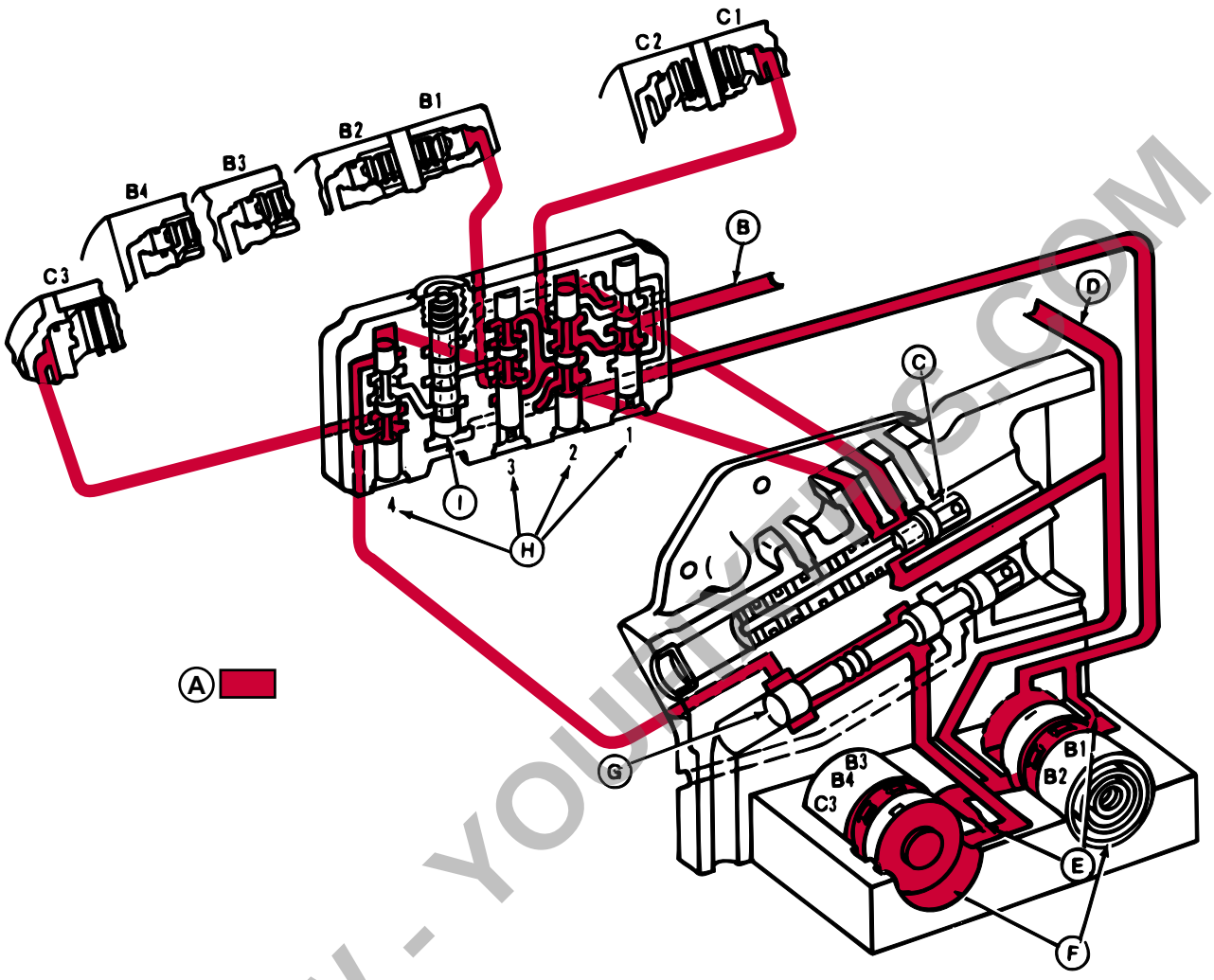
T5842AF -UN-24MAY88

A—Batteries
B—Starter Solenoid
C—Starter Relay
D—Circuit Breaker
E—Alternator
F—Red Connector
G—Alternator Indicator Light
H—Key Switch
I—Resistance Wire
J—Splice 20C—20E
K—Bullet Connector
L—Bullet Connector
M—Gauge Fuse

T59,9015,373 -19-03JUL84

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A—High Pressure Oil
B—From Pedal Valve
C—Speed Selector Valve
D—From Transmission Filter
E—Orifice (2 used)
F—Accumulators (2 used)
G—Direction Selector Valve
H—Shift Valves
I—Dump Valve

First Forward

T59,9020,255 -19-20JUL90

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INCH CAP SCREW TORQUE VALUES

SAE Grade	Head Markings	SAE Grade	Nut Markings
SAE GRADE 1 SAE GRADE 2	No Mark	2	No Mark

SAE Grade	Head Markings	SAE Grade
SAE GRADE 5 SAE GRADE 5.1 SAE GRADE 5.2		5 Nut Markings

SAE Grade	Nut Markings	SAE Grade
SAE GRADE 8 SAE GRADE 8.2		8 Nut Markings

DIA.	WRENCH SIZE	SAE GRADE 1 OIL	SAE GRADE 1 DRY	*SAE GRADE 2 OIL	*SAE GRADE 2 DRY	SAE GRADE 5 OIL	SAE GRADE 5 DRY	SAE GRADE 8 OIL	SAE GRADE 8 DRY
		N•m(lb-in)	N•m(lb-in)	N•m(lb-in)	N•m(lb-in)	N•m(lb-in)	N•m(lb-in)	N•m(lb-in)	N•m(lb-in)
#6		0.5(4.5)	0.7(6)			1.4(12)	1.7(15)		
#8		0.9(8)	1.2(11)			2.4(21)	3.2(28)		
#10		1.4(12)	1.8(16)			3.4(30)	4.6(41)		
#12		2(19)	2.8(25)			5.4(48)	7.3(65)		
		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)
1/4	7/16	3.5(2.5)	4(3)	5(4)	7(5)	8(6)	11(8)	12(8.5)	16(12)
5/16	1/2	7(5)	9(6.5)	10(7.5)	14(10)	16(12)	23(17)	24(18)	33(24)
3/8	9/16	12(8.5)	16(12)	19(14)	24(18)	30(22)	41(30)	41(30)	54(40)
7/16	5/8	19(14)	26(19)	30(22)	41(30)	47(35)	68(50)	68(50)	95(70)
1/2	3/4	24(21)	41(30)	47(35)	61(45)	75(55)	102(75)	102(75)	142(105)
9/16	13/16	41(30)	54(40)	68(50)	88(65)	108(80)	142(105)	149(110)	203(150)
5/8	15/16	54(40)	75(55)	88(65)	122(90)	149(110)	197(145)	203(150)	278(205)
3/4	1-1/8	102(75)	136(100)	163(120)	217(160)	258(190)	353(260)	366(270)	495(365)
7/8	1-5/16	163(120)	244(165)	163(120)	224(165)	414(305)	563(415)	590(435)	800(590)
1	1-1/2	244(180)	332(245)	244(180)	332(245)	624(460)	848(625)	881(650)	1193(880)
1-1/8	1-11/16	346(255)	468(345)	346(255)	468(345)	780(575)	1058(780)	1248(920)	1695(1250)
1-1/4	1-7/8	488(360)	664(490)	488(360)	665(490)	1098(810)	1492(1100)	1763(1300)	2393(1765)
1-3/8	2-1/16	637(470)	868(640)	637(470)	868(640)	1438(1061)	1953(1440)	2312(1705)	3140(2315)
1-1/2	2-1/4	848(625)	1153(850)	848(625)	1153(850)	1912(1410)	2590(1910)	3065(2260)	4163(3070)

TS297 -19-09AUG89

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

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

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

Make sure fastener threads are clean and 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 amount shown in chart. Tighten toothed or serrated-type lock nuts to full torque value.

**For SAE Grade 2 fasteners (152 mm) 6-in. or less in length, use torque values for SAE Grade 2. For fasteners longer than (152 mm) 6-in., use SAE Grade 1 torque values.*

O53,TORQ1 -19-26JAN90

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SLOW AND FAST IDLE ADJUSTMENT

SPECIFICATIONS

Slow idle adjustment	800 ± 50 rpm
Fast idle adjustment	2400 ± 25 rpm

ESSENTIAL TOOLS

JDF-10 Sealing Wire Pliers

SERVICE EQUIPMENT AND TOOLS

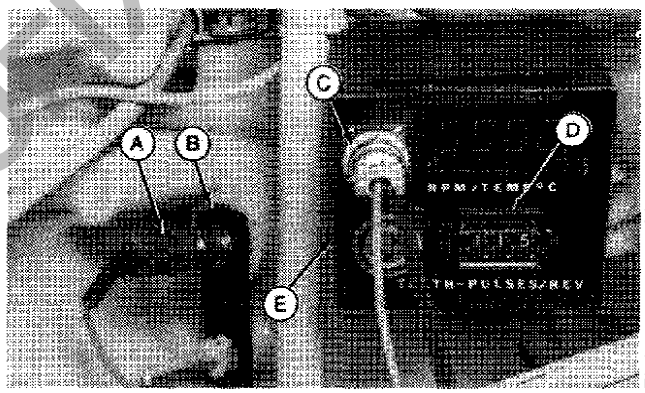
Tachometer

T59,9010,242 -19-06MAY88

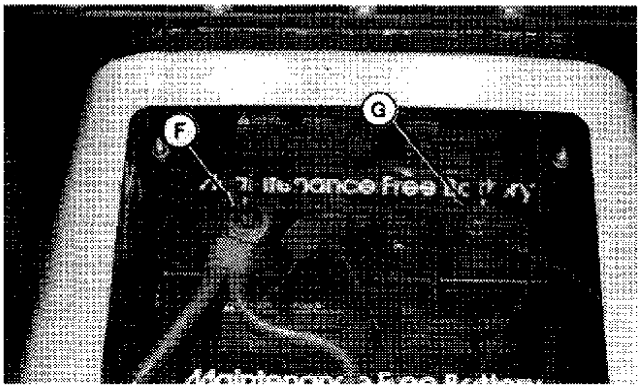
1. Run engine until it is at normal operating temperature.

2. Remove timing pin and plug. Connect tachometer as shown.

A—Magnetic Pickup
B—Mounting Plate
C—Power/RPM Cable
D—Thumb Dial (at 115)
E—Tachometer/Temperature Reader
F—Red Clip (Positive)
G—Black Clip (Negative)



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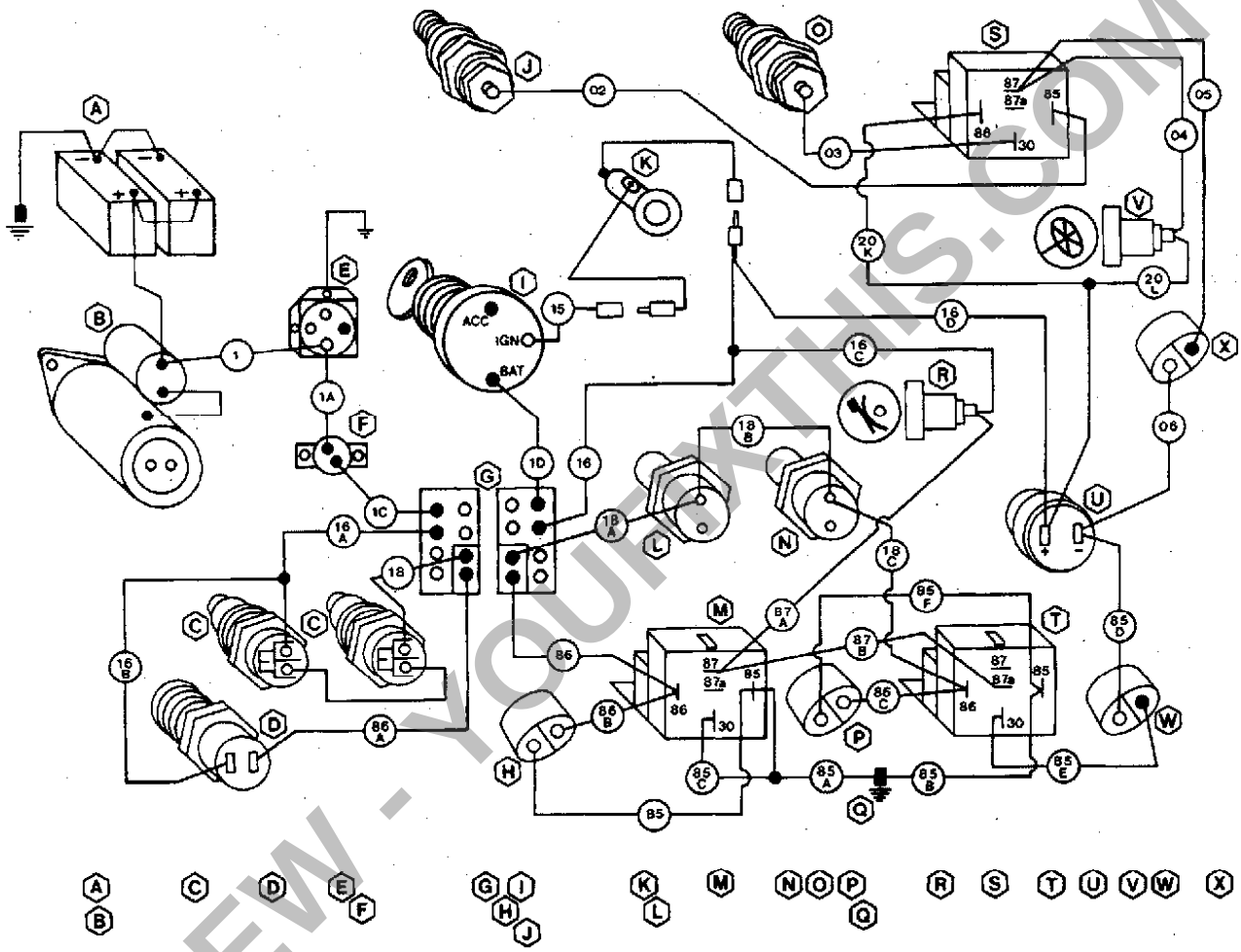
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PARK BRAKE AND SECONDARY STEERING CIRCUIT OPERATION



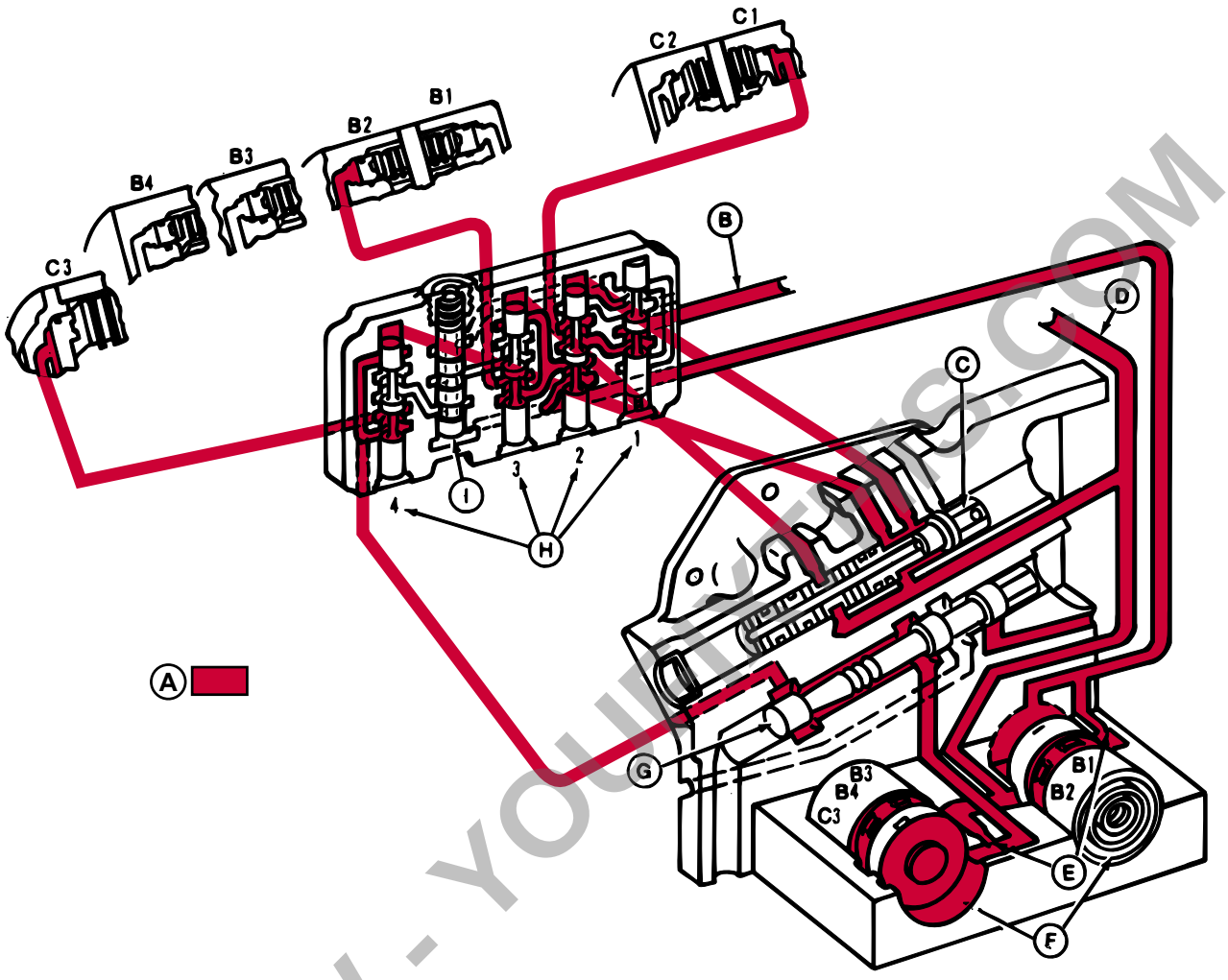
T8801AA -UN-17OCT88

A—Batteries
B—Starter Solenoid
C—Neutral Start Switch
D—Park Brake Switch
E—Start Relay
F—Circuit Breaker
G—Red Connector
H—Diode
I—Key Switch
J—Secondary Steering Switch (Front)
K—Start Fuse
L—Start Button
M—Relay #1
N—Start Aid Button
O—Secondary Steering Switch (Rear)
P—Diode
Q—Ground Bracket
R—Park Brake Light
S—Secondary Steering Relay
T—Relay #2
U—Buzzer
V—Secondary Steering Light
W—Diode
X—Diode

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T94399 -UN-

A—High Pressure Oil
B—From Pedal Valve
C—Speed Selector Valve
D—From Transmission Filter
E—Orifice (2 used)
F—Accumulator (2 used)
G—Direction Selector Valve
H—Shift Valves
I—Dump Valve

Second Forward

T59,9020,237 -19-20JUL90

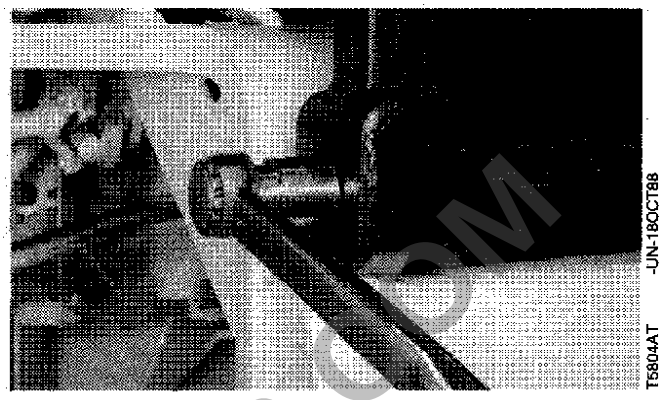
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KEEPS ROPS INSTALLED PROPERLY

CAUTION: Make certain all parts are reinstalled correctly if the roll-over protective structure (ROPS) is loosened or removed for any reason. Tighten mounting bolts (A) to proper torque.

The protection offered by ROPS will be impaired if ROPS is subjected to structural damage, is involved in an overturn incident, or is in any way altered. A damaged ROPS should be replaced, not reused.



SPECIFICATION

ROPS mounting bolts torque	70—150 ft-lb (95—203 N·m)
Limb risers to canopy	70—150 ft-lb (95—203 N·m)

When installation of equipment on a machine requires loosening or removing Roll-Over Protective Structure, mounting bolts must be tightened.

04T,90,K148 -19-09MAY88

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VALVE CLEARANCE ADJUSTMENT

SPECIFICATIONS

Intake Valve	0.36 mm (0.014 in.)
Exhaust Valve	0.46 mm (0.018 in.)

ESSENTIAL TOOLS

JDE-81-1 Flywheel Turning Tool
JDE-81-4 Timing Pin

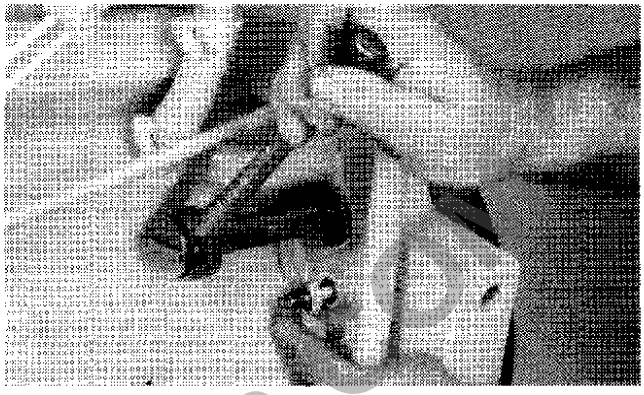
1. Remove rocker arm cover.

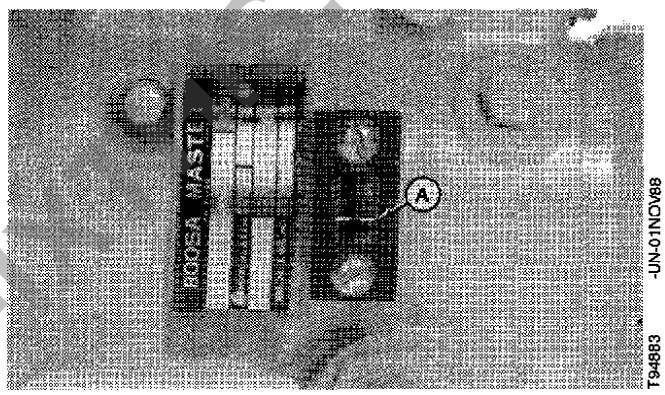
2. Install timing pin and flywheel turning tool.

3. Turn flywheel until timing pin goes into hole in flywheel.

4. Remove timing hole cover from fuel injection pump.

5. If the timing line (A) on the governor weight retainer is visible, the number one piston is at top dead center (TDC) on the compression stroke. If the timing line is not visible, the number six piston is at TDC on the compression stroke.





10T,9010,M60 -19-11MAY88

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TM1441-19-24JUL90

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HANDLE FLUIDS SAFELY—AVOID FIRES

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 -UN-23AUG88

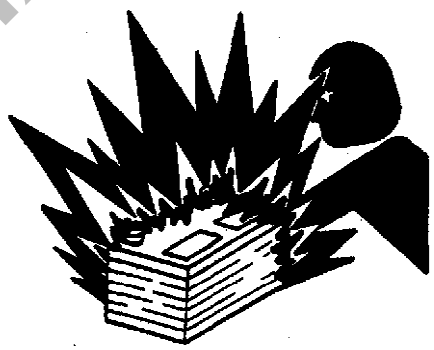
O53,FLAME -19-26JAN90

PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



TS204 -UN-23AUG88

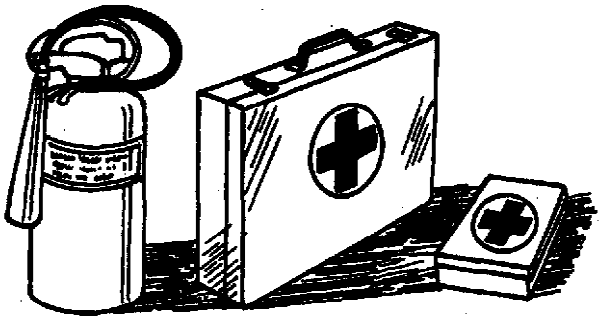
O53,SPARKS -19-26JAN90

PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 -UN-23AUG88

O53,FIRE2 -19-26JAN90

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Section 9015
ELECTRICAL OPERATION AND TESTS

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Symptom	Problem	Solution
	Differential lock pressure oil leaking at: piston seals, sealing rings, or around differential bearing cup.	Remove differential check plugs and check leakage. (Do Differential Lock Sealing Ring Leakage Test.) (See Group 9020-25.)
	Brake piston seals leaking	Remove front differential check plug. Actuate brake and observe leakage from check plug. Repair.
	Differential turbocharger air system orifices plugged or internal line restriction	Check for air flow from line. Clean orifices. Repair.
Excessive Differential and/or Axle Noise	Low oil level in differential	Check oil. Remove drain plug and inspect for metal particles in differential case. Disassemble and determine cause.
	Brakes dragging	Destroke hydraulic pump. Rerun Brake Drag Operational Check. (See Section 9005-10.)
	Park brake dragging	Manually release brake and rerun Brake Drag Operational Check. (See Section 9005-10.)
	Pinion bearing failed	Remove and inspect pinion. Check to ensure pinion housing was indexed.
	Gear mesh pattern between ring and pinion gear incorrect	Remove pinion gear housing and inspect ring and pinion gear.
	Differential pinion gears and/or cross shafts failed	Remove differential housing drain plug and inspect for metal particles. Disassemble and inspect.
	Axle bearing failed	Check axle shaft movement in axle housing by raising unit and observing shaft movement in housing.
	Mechanical failure in axle planetary	Remove differential. Inspect, repair.
Oil Seeping From Outer Axle Seal	Excessive axle end play	Check movement of axle in housing by raising unit.

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