ACCESSORY CIRCUITS

Typical current draw of components with engine “OFF” and batteries at 12.6 volts and checked with an amp meter in series with battery ground.

SOUND-GARD body door open (dome lamp on)	0.5 amp
Dome lamp switch (dome lamp on)	0.5 amp
Horn	9.5 amps
Cigar lighter	4.0 amps
Light switch at:	
Warning	2—8 amps
Highway (high beam)	18—24 amps
Highway (low beam)	11—16 amps
Field (high beam including 4 upper flood lamps)	42 amps
Field (low beam)	32 amps
Key switch on:	
During lamp check	1.8 amps
After lamp check	0.5 amps
Turn signals (right or left)	6—8 amps
Electric starting aid	9—11 amps
Radio	1.0 amp
Wiper motor (front)	
Slow	2.0 amps
Fast	3.0 amps
A/C Heater control at VENT	
Pressurizer and circulator motors at	
LO	14.0 amps
MED	16.0 amps
Hi	18.0 amps
++	24.0 amps
A/C Heater control at A/C	
Pressurizer and circulator motors at ++	27 amps
A/C compressor	3.0 amps

RX1550,240,B -19-11JUN93

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ISO HYDRAULIC SYMBOLS

Pumps

- Hydraulic Pump: Fixed Displacement
- Variable Dispalacement

Motors and Cylinders

- Hydraulic Motor: Fixed Displacement
- Variable Displacement
- Cylinder, Single acting
- Cylinder, Double Acting
  - Single End Rod
  - Double End Rod
  - Adjustable Cushion Advance Only
  - Differential Piston

Miscellaneous Units

- Electric Motor
- Accumulator, Spring Loaded
- Accumulator, Gas Charged
- Heater
- Cooler
- Temperature Controller
- Filter,Strainer
- Pressure Switch
- Pressure Indicator
- Temperature Indicator
- Direction of Shaft Rotation (Assume Arrow on Near Side of Shaft)

Valves

- Check
- On-Off (Manual Shut-off)
- Pressure Relief
- Pressure Reducing
- Flow Control, Adjustable-Non-Compensated
- Flow Control,Adjustable (Temperature and Pressure Compensated)
- Two Position Two Connection
- Two Position Three Connection
- Two Position Four Connection
- Three Position Four Connection
- Two Position in Transition
- Valves Capable of Infinite Positioning (Horizontal Bars Indicate Infinite Positioning Ability)

Methods of Operation

- Spring
- Manual
- Push Button
- Push-Pull Lever
- Pedal or Treadle
- Mechanical
- Detent
- Pressure Compensated
- Solenoid, Single Winding
- Reversing Motor
- Pilot Pressure
  - Remote Supply
  - Internal Supply

Lines

- Line, Working (Main)
- Line, Pilot (For Control)
- Line, Liquid Drain
- Flow, Direction Of
  - Hydraulic
  - Pneumatic
- Lines Crossing
- Lines Joining
- Line with Fixed Restriction
- Line, Flexible
- Station, Testing, Measurement or Power Take-Off
- Variable Component (Run Arrow Through Symbol at 45)
- Pressure Compensated Units (Arrow Parallel to Short Side of Symbol)
- Temperature Cause or Effect
- Reservoir
  - Vented
  - Pressurized
- Line to Reservoir
  - Above Fluid Level
  - Below Fluid Level

-19-20MAY94

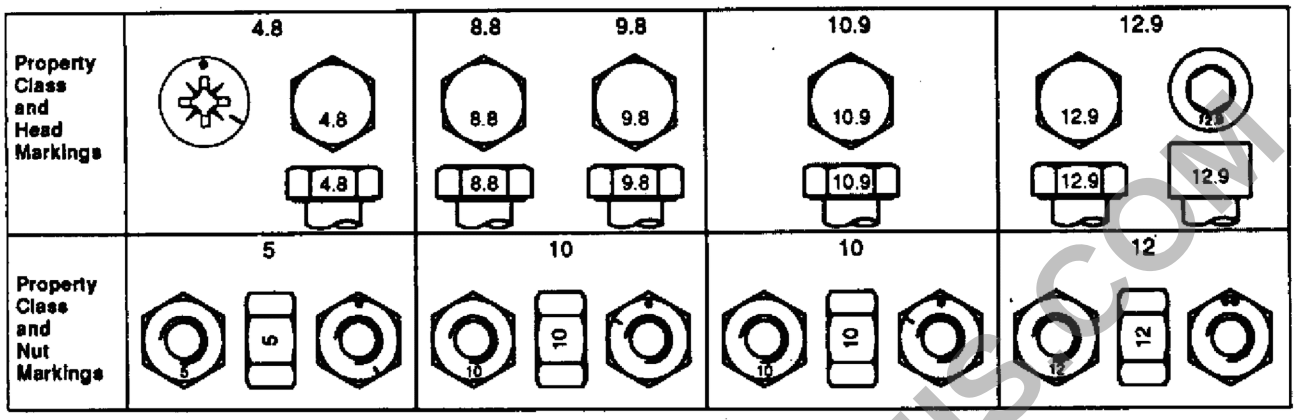
RW3480L

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70U,270005,IX2 -19-10FEB92

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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	225	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 -19-16APR92

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ECU codes that may appear are:

Code	Description	Symptom	Action
11	Hand throttle sensor out of range high	Partial or total loss of throttle control. Engine will run at slow idle while fault is occurring. Engine speed will probably be erratic if fault is intermittent.	Continued operation will not harm the engine. Repair at a convenient time.
12	Handle throttle sensor out of range low	Same as code 11	Same as code 11.
32	Actuator solenoid circuit fault	Engine will stall and will not restart	Check harness and connectors. If this does not correct fault then go to CTM-11
34	Rack position error	Engine may perform erratically or shut down. Engine should restart but will likely exhibit same symptoms	Go to CTM-11.
35	Rack position voltage out of range high	Erratic engine speed or engine may stall	Go to CTM-11.
36	Rack position voltage out of range high	Erratic engine speed or engine may stall	Go to CTM-11.
37	Fuel temperature sensor out of range high	Power change due to temperature. Engine may start hard or be smokey on start-up.	Continued operation will not harm engine. Performance loss may be only slight. Repair at a convenient time.
38	Fuel temperature sensor out of range low	Same as code 37	Same as code 37.
39	Primary speed sensor error	Momentary erratic speed	Continued operation will not harm engine. Erratic performance may return to normal in (minutes to hours) when sensor fails completely. Repair at a convenient time.
41	Start signal missing	Engine may start to die then recover, or may take longer to start at very cold temperatures	Check harness and connectors. If this does not correct fault then go to CTM-11.
42	Engine overspeed	Engine may overspeed by being pushed downhill	Continued operation will not harm engine. Action not required if no other symptom exits.

RX143422010,18 -19-14MAY91

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INTRODUCTION

This procedure is designed so technician can make a quick check of machine operation.

A location will be required which is level, has adequate space to complete the driving checks and to work the unit.

The engine and all other major components must be at operating temperature for some checks.

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

No special tools or gauges are needed. Always start in the left column and read completely, following this sequence from left-to-right. Read each check completely before performing.

Complete all checks before making repairs. Refer to the appropriate section if further diagnosis is needed.

U10,G378 -19-21JAN93

❶ LIGHTING CIRCUIT: WIRE NUMBERS 100 THROUGH 199

Key switch “OFF”.

1. LIGHT SWITCH POSITION:	**W**	**H**	**H**	**F**	**F**
DIMMER SWITCH POSITION:		**Hi**	**Lo**	**Hi**	**Lo**
Warning indicator lamps (2)	X	X	X		
Warning lamps (4)	X	X	X		
Extremity lamps (2) (If equipped)	X	X	X		
Trail lamps (2)		X	X		
Instrument & console (5)		X	X	X	X
Head lamps (4)		X(4)	X(2)	X(4)	X(4)
High beam indicator lamp (1)		X			
Upper rear flood lamps (4)				X	
Lower rear flood lamps (4)				X	X

Key switch “ON”.

2. Turn signal switch:

Lever “UP” . . . . . Right-hand warning and indicator lamps flashing.
Left-hand warning and indicator lamps steady.

Lever “DOWN” . . . . . Left-hand warning and indicator lamps flashing.
Right-hand warning and indicator lamps steady.

OK: GO TO❷

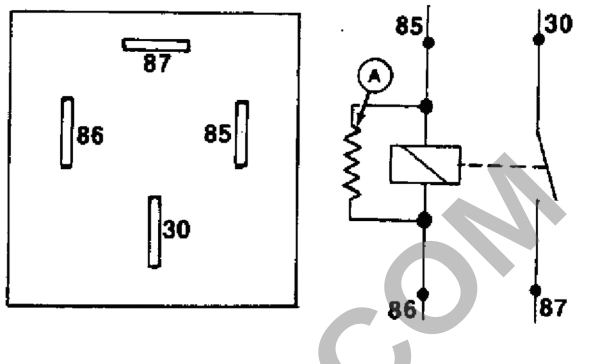
NOT OK: See Section 240 after operational checks

TM1550,2110,A -19-02MAR93

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TESTING LOAD CENTER RELAYS



RW22765 -UN-17FEB93

NOTE: There is a 680 ohm resistor across relay terminals 85 and 86. The resistor is located inside the relay, not on the load center board.

1. Carefully note how relay is mounted and terminal positions before removing.

2. Typical coil resistance (across terminals 85 and 86) is 680 ohms for a known good relay.

- If resistance is more than 680 ohms, the parallel resistor (A) is open. Replace the relay.
- If resistance is less than 680 ohms, the coil is shorted. Replace the relay.
- If resistance is 550 ohms or more, the coil is open. Replace the relay.

3. Connect ohmmeter to terminals 30 and 87. Switch should be open--giving infinite resistance. If not, replace relay.

4. Connect 12-volt battery to terminals 85 and 86. Switch should close, giving zero resistance across terminals 30 and 87, if not, replace relay.

NOTE: Terminal 86 is ground on all relays except K2 and K8. Terminal 85 is ground on relays K2 and K8.

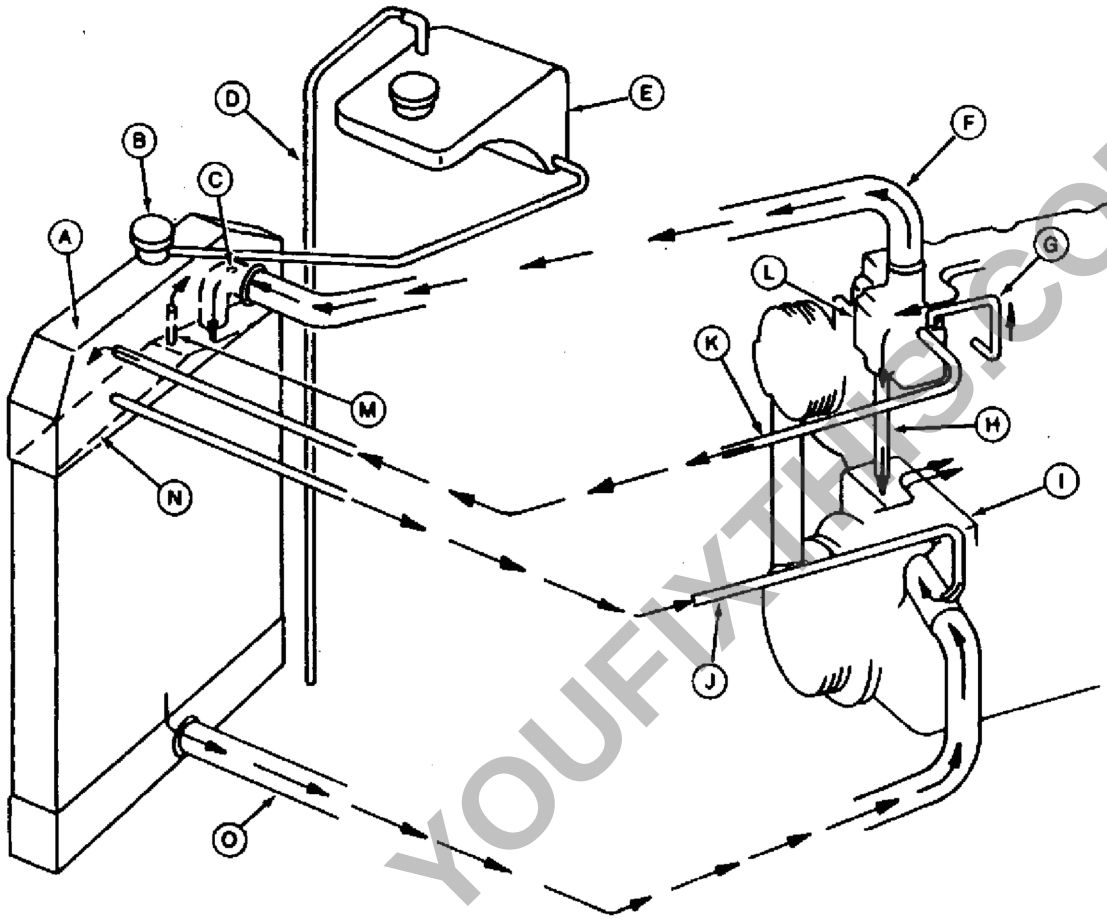
TM1550,24010,E -19-03MAR93

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7

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COOLING SYSTEM OPERATION



RW18437 -UN-19MAR91

A—Deaeration Chamber
B—Radiator Cap
C—Pin Hole
D—Overflow Line
E—Coolant Recovery Tank
F—Coolant Return Line
G—Head Deaeration Line
H—Bypass Tube
I—Water Pump Housing
J—Fill Line
K—Deaeration Line
L—Thermostat Housing
M—Stand Pipe
N—Baffle Plate
O—Coolant Outlet Line

The pump (I) draws coolant from the bottom of the radiator through outlet line (O) and discharges it into the cooling passages of the engine head and block. After it circulates through the head and the block it flows into the thermostat housing (L). If the thermostats are closed (as during warm-up), coolant is directed back to the pump through the bypass tube (H) to be recirculated. If the thermostats are open, coolant flows through the return line (F) into the deaeration chamber (A).

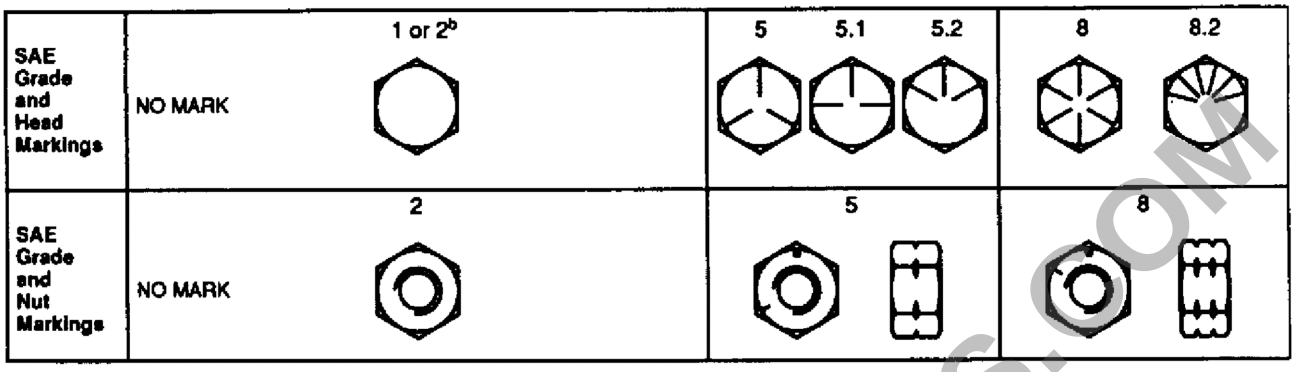
Pin hole (C) bleeds off air from returned coolant before it enters the main coolant flow. A baffle plate (N) separates the deaeration chamber from the lower coolant chamber. A stand pipe (M) through the baffle plate allows air from the main coolant chamber to rise to the deaeration chamber. Fill line (J) allows deaerated coolant to enter the main coolant flow. Deaeration line (K) bleeds air from the thermostat housing to the deaeration chamber. The head deaeration line (G) releases trapped air from the top of the head during cooling system filling.

RX143422025,1 -19-05JUN91

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UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES



TS1162 -19-04MAR91

Size	Grade 1				Grade 2[b]				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	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
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	215	160	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

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 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 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.

[b] Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

DX,TORQ1 -19-15MAR91

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ECU codes that may appear are:

Code	Description	Symptom	Action
44	Auxiliary speed sensor error	No tachometer RPM display or erratic performance	Continued operation will not harm engine. Erratic performance may return to normal in (minutes or hours) when sensor fails completely. Repair at a convenient time.

NOTE: If using the Electronic Governor Tester-JTO 5829 Codes 71, 72, 73 and 74 may appear. These codes are explained in CTM-11.

RX143422010,19 -19-29JAN92

ECU DIAGNOSTIC CODES (8970 ONLY)

NOTE: Only Cummins Engine Company, its distributors, or servicing dealers are authorized to service the NTA 855A Engine.

If your dealership is authorized to service this engine, refer to the Cummins service literature.

Engine warranty may be void on any unauthorized service.

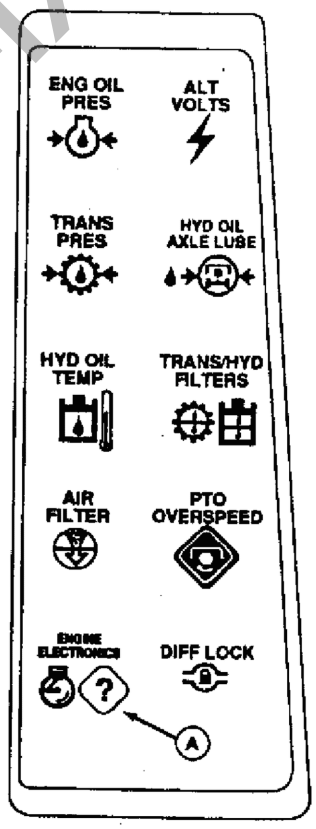
Stored diagnostic flash codes will be displayed on the Engine Electronics Lamp (A). To view flash codes, stop the engine, turn key to ON position and press button on Field/Cruise Module (located under right-hand console). A series of flash codes will be displayed to show diagnostic problem that has occured.

Example: Flash—1 sec. pause—Flash Flash—1 sec pause—Flash

Diagnostic code 1 2 1 has been displayed. See following chart for flash codes and descriptions.

Diagnostic flash code will be repeated after a 2 second delay. To view additional flash codes, press button on field/cruise module.

To stop diagnostic flash codes, turn key to OFF position.



RW22958 -UN-15JUN93

RX1550,22010,AF-19-11JUN93

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❷ **ACCESSORY CIRCUIT: WIRE NUMBERS 200 THROUGH 299** Key switch “OFF”. 1. Dome lamp and door switch: SGB door “OPEN” . . . . . Lamp “ON” SGB door “CLOSED” . . . . . Lamp “OUT” 2. Dome lamp and dome lamp switch: SGB door “CLOSED” and dome lamp switch “ON” . . . . . Lamp “ON” 3. Horn switch held “ON” . . . . . Horn sounds 4. Lighter pushed “IN” . . . . . Lighter element heats Key switch “ON”. 5. Radio switch “ON”. (If not equipped, GO TO next step) Select AM station . . . . . Radio operating Select FM station . . . . . Radio operating Digital clock . . . . . Should be operating If time is incorrect . . . . . Adjust 6. Wiper switch: Switch momentarily to “SLOW” . . . . . Wiper motor operates at slow speed Switch momentarily to “FAST” . . . . . Wiper motor operates at fast speed 7. A/C-Heater control lever at “VENT”: Pressurizer motor . . . . . Constant fast speed Circulator motor switch: Lo . . . . . Slow fan speed O . . . . . Medium fan speed HI . . . . . High fan speed + + ... Purge fan speed *NOTE: Motor operation is the same at A/C, Heat and Defrost positions.* 8. A/C Heater control lever at HEAT then A/C on DEFROST . . . . . A/C compressor clutch will click during engagement *NOTE: When A/C system pressure is below 265—320 kPa (2.6—3.2 bar) (39—46 psi) clutch will not engage. Engine compartment temperature must be above 10˚ C (50˚F) for the clutch to engage.* Key switch “OFF”. 9. Coolant level lamp switch . Push switch, lamps “ON” Release switch, lamps “OFF”				**OK:** GO TO ❸ **NOT OK:** See Section 240 after operational checks TM1550,2110,B -19-02MAR93
❸ **DIFFERENTIAL LOCK: ACCESSORY CIRCUIT WIRE NUMBERS 200 THROUGH 299.**	Stop tractor. With engine at slow idle, press and hold differential lock in engaged position.	Within 2 seconds there should be a noticeable load change on the engine. *LISTEN: For the hydraulic pump going into stroke.*	*NOTE: There may not be a load change when differential lock switch is released.*	**OK:** GO TO ❹ **NOT OK:** See Section 240 after operational checks TM1550,2110,C -19-02MAR93

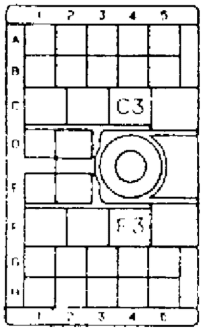
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UPPER HARNESS CONNECTOR AT LOAD CENTER (C-1)

Upper load center connector (C-1) is located on the back side of the load center below the steering column.

NOTE: Connector pin identification is given for the open side of the connector.



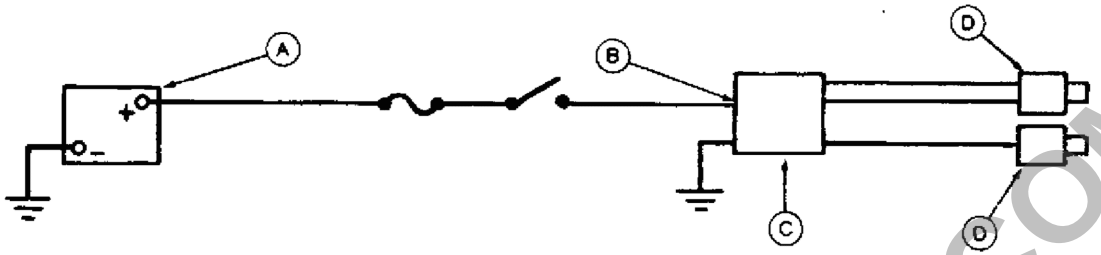
RW13002 -UN-01MAR89

Pin No.	Wire No.	Circuit	Wire Color
A1	114	Lighting—to inner front floods	Yellow
A2, A3, A4	Open		
A5	211	Accessory—To AQS pressurizer motor	Brown
B1	900	Ground at battery	Black
B2	222	Accessory—To clock, dome lamp and auxiliary power connector (in cab roof)	Red
B3, B4	Open		
B5	254	Accessory—From A/C Master on/off switch to relay K3 (terminal no. 85)	Yellow
C1	115	Lighting—To fender floods and high beam indicator diode	Green
C2	Open		
C3	213	Accessory—To A/C circulator motor	Orange
D1	119	Lighting—To dimmer switch, high beam indicator, relay K10 (terminal no. 85) and relay K8 (terminal no. 86)	White
D2	212	Accessory—To coolant level lamp switch, horn switch, cigar lighter and accessory outlet (in console)	Red
E1	Open		
E2	105	Lighting—To relay K9 (terminal no. 85)	Green
F1	118	Lighting—To roof floods	Gray
F2, F3, G1	Open		
G2	113	Lighting—To tail lights and seven-pin connector (pin 6)	Orange
G3	123	Lighting—From tachometer (right-turn signal) to relay K2 (terminal no. 85)	Orange
G4	117	Lighting—To 7-pin connector (pin 5)	Purple
G5	117	Lighting—To right turn indicator and lamps	Purple
H1	Open		
H2	104	Lighting—To light switch (terminal TL)	Yellow
H3	121	Lighting—from tachometer (left-turn signal) to relay K1 (terminal no. 86)	Brown
H4	124	Lighting—To 7-pin connector (pin 3)	Yellow
H5	124	Lighting—To left-turn indicator and lamps	Yellow

RX143424010,4 -19-04APR91

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ELECTRONIC CIRCUIT



RW12979 -UN-15DEC88

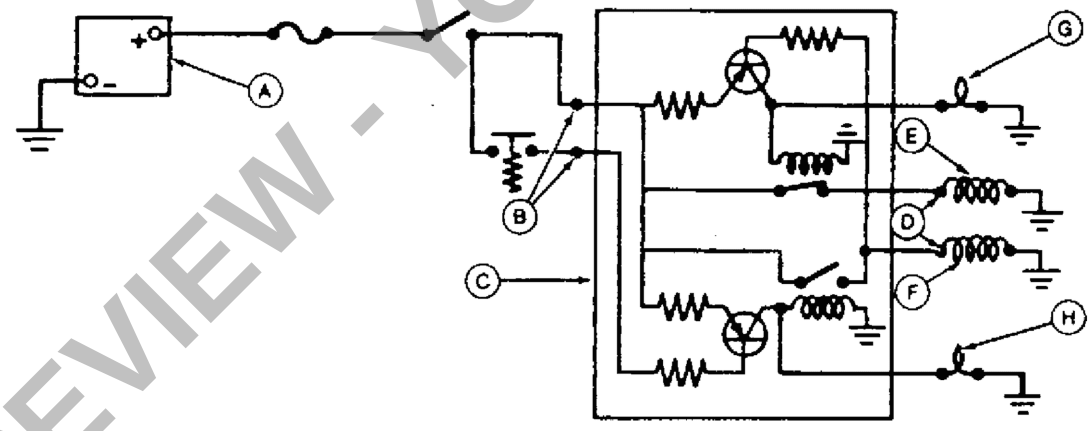
A—Source Voltage
B—End of Electrical Circuit, Beginning of Electronic Circuit
C—Electronic Module
D—Load

This circuit begins where the source voltage (A) of an electrical circuit enters an electronic module (B) or electronic control device (C).

Usually, source voltage has been changed with electronic components by decreasing the voltage and current flow to the load (D). The voltage can also be increased.

240
05
13

RX143424005,2 -19-31MAY91



RW17007 -UN-22MAY89

A—Source Voltage
B—End of Electrical Circuit, Beginning of Electronic Circuit
C—Electronic Module
D—Source of Voltage at Load
E—Solenoid No. 1
F—Solenoid No. 2
G—Indicator Lamp ON, Solenoid No. 1 Disengaged
H—Indicator Lamp ON, Solenoid No. 2 Engaged

Even though electronic circuits use small amounts of current to operate electronic components, a secondary circuit of source voltage (D) to electrical components can pass through an electronically controlled relay inside a module. This secondary circuit is still considered to be part of the electronic circuit.

RX143424005,3 -19-08JUL91

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Flash Code	Fault Description
111	Internal electronic control module failure.
115	No engine speed signal detected at engine speed sensor pins. (both signals lost)
121	No engine speed signal detected at one pair of engine speed sensor pins
131	Hi voltage detected at throttle position sensor (out of range high failure)
132	Lo voltage detected at throttle position sensor (out of range lo failure)
234	Engine overspeed fault
254	Lo voltage detected at auxiliary fuel shutoff driver pin No. 1
255	Hi voltage detected at auxiliary fuel shutoff driver pin No. 1 when power is off
341	Electronic control module error at power-up
342	Electronic control module EEPROM (electronic erasable programmable read only memory) checksum error at power-up
353	Electronic control module EEPROM (electronic erasable programmable read only memory) write error inside electronic control module.
412	Data transmit error on DATALINK pins No. 6 and 8
414	Data receipt error on DATALINK pins No. 6 and 8
441	Lo battery supply voltage
442	Hi battery supply voltage
443	Lo voltage detected at throttle position sensor
444	Lo voltage detected at rail pressure sensor pin No. 11
451	Hi voltage detected at rail pressure sensor pin No. 14
452	Lo voltage detected at rail position sensor pin No. 14
455	Hi voltage detected at electronic control module pin No. 21 when should be Lo and electronic fuel control return current is Lo when should be Hi, or high voltage detected at electronic control module pin No. 21 when should be Lo and electronic fuel control return current is Hi when should be Lo.
511	Lo electronic fuel control current return detected at pin No. 10 and rail pressure is Lo when both should be high.
514	Hi rail pressure detected when electronic control module is commanding Lo.
525	Electronic control module not calibrated with electronic data base network or the electronic control module has failed.
552	Lo rail pressure detected when electronic control module is commanding Hi.
554	Voltage detected at rail pressure signal pin No. 14.

RX1550,22010,AG-19-11JUN93

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❹ **ETHER START AID: ACCESSORY CIRCUIT WIRE NUMBERS 200 THROUGH 299.**	With engine at slow idle, momentarily depress and release either start switch.	*LISTEN: For increase in engine rpm.*	**NOT OK:** See Section 240 after operational checks TM1550,2110,D -19-02MAR93

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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.

TM1550-19-14MAR97

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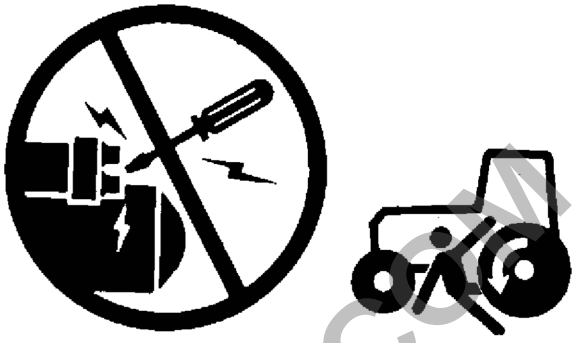
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PREVENT MACHINE RUNAWAY

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.



TS177 -UN-11JAN89

DX,BYPAS1 -19-03MAR93

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

DX,FLAME -19-04JUN90

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

DX,SPARKS -19-03MAR93

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AIR INTAKE SYSTEM/8970

The 8970 differs from the 8570, 8770 and 8870 Tractors. On the 8970, compressed air from the turbocharger enters a water-to-air aftercooler. This aftercooler acts as a heat exchanger and uses engine coolant as a media to cool the compressed air prior to entering the intake manifold.

The rest of the air intake system is the same as the 8570, 8770 and 8870 Tractors.

See Cummins Service Literature for more information.

TM1550,2305D -19-08FEB93

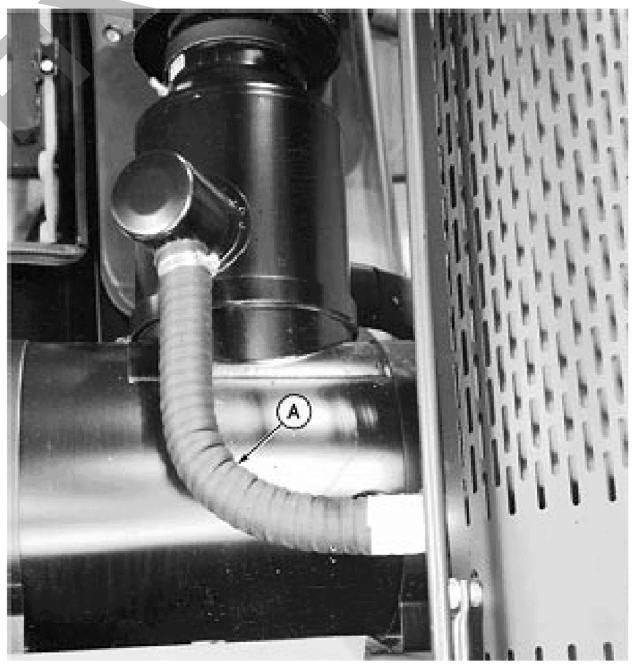
TESTING ASPIRATOR VACUUM

A venturi is built into the exhaust portion of the muffler to increase exhaust velocity. The increased velocity creates a vacuum at the venturi. The vacuum draws separated dust particles from the pre-cleaner into the muffler where it is expelled through the muffler.

1. Disconnect and remove aspirator hose (A) from pre-cleaner and muffler.

2. Install a section of radiator hose and drill a hole to accept D-05022ST Water Vacuum Gauge.

3. Operate engine at 2100 rpm. Aspirator vacuum should be at least 305 mm (12 in.) water.

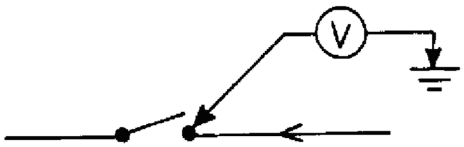


RW22700 -UN-20JAN93

TM1550,2305E -19-10JUN93

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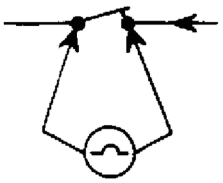


RW15930 -UN-20DEC88

NOTE: Test procedure is the same for the PST. Refer to PST control circuit schematic in Section 255 Group 25. The neutral start switch is located in the PST shift module.

2. Check MST shift linkage and neutral start switch located on right hand side of transmission case (behind tank and frame) for neutral adjustment.

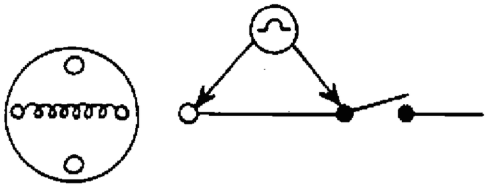
3. Check continuity across neutral start switch for less than 0.5 ohm when switch is closed.



RW15931 -UN-20DEC88

4. Check continuity of circuit from neutral start switch to starter circuit relay coil (+) terminal for less than 0.5 ohm with starter circuit relay disconnected.

NOTE: Connect relay after testing or repair.



RW15935 -UN-20DEC88

Repair circuit, then GO TO A1

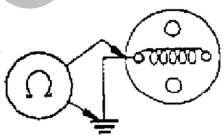
TM1550,24025,N -19-11JUN93

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D3

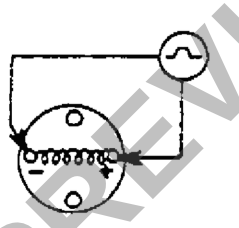
Perform the following checks:

1. Check ground circuit No. 010 from starter circuit relay coil (-) terminal for less than 0.5 ohm.



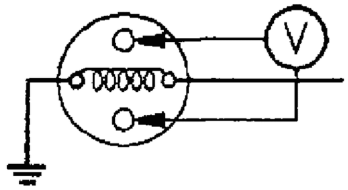
RW17049 -UN-19MAY89

2. Check continuity across (+) and (-) terminals of starter circuit relay coil for 1.8—2.2 ohms.



RW17050 -UN-19MAY89

3. Check voltage drop across battery terminals of starter circuit relay for less than 0.2 volt with key switch at start position.



RW17051 -UN-19MAY89

OK: GO TO D4

NOT OK: Repair, then GO TO A1

RX143424025,5 -19-06NOV89

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GROUND SPEED

Wheel speed is calculated by the tachometer using the magnetic speed pickup signal—unless the optional radar sensor (true ground speed sensor) is installed. Either wheel speed or true ground speed is displayed in the lower three digits of the tachometer. At speeds below 0.8 km/h (0.5 mph), the display will read 0.

Selection of English or metric units and tire size is made within the calibration mode.

The radar sensor is covered with the performance monitor in Group 40.

U40,B246 -19-31MAY91

HOURMETER

Engine hours is displayed in the lower five digits at bottom of the display. Engine hours only accumulate when engine speed is greater than 700 rpm. The accumulated value is upgraded every 0.1 hours starting 3 minutes after engine speed exceeds 700 rpm. Maximum accumulated value displayed is 9999.9 hours—except in diagnostic mode (dSP inFo No. 12) where the maximum is 99,999 hours.

U40,B247 -19-31MAY91

TURN SIGNALS AND HAZARD WARNING LAMPS

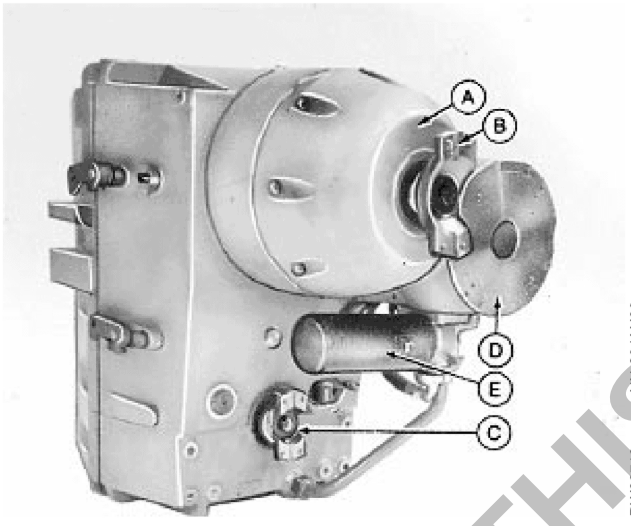
The tachometer is the controller for the turn signals and hazard warning lamps. This circuit is part of the accessories circuit and is covered in Group 55.

24035,RX,A -19-08MAR93

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TRANSMISSION IDENTIFICATION (FRONT)



A—Front Cover
B—Yoke
C—Yoke
D—Cover
E—Oil Filter

24—Speed Powrsync Illustrated

The 12-Speed Syncro and 24-Speed POWRSYNC transmissions are connected to engine, axles and PTO by U-joint drive shafts.

Transmission lube and control oil are separated from the hydraulic oil system.

Traction clutch and two-speed planetary are contained in front cover (A).

Engine power is received at yoke (B). Front axle is driven by yoke (C).

Main hydraulic pump mounts at cover (D).

Transmission oil filter (E) filters oil from the transmission oil pump before oil reaches transmission control valve housing on left side of transmission.

TM1550,25025B -19-10JUN93

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ADJUST UPSHIFT/DOWNSHIFT SWITCHES

1. Remove lock nuts (B). Turn special cap screw (A) counterclockwise until it stops.

2. Clean old threadlocker off threads of special cap screws and lock nuts.

3. Apply a light coat, to the first few threads (next to the actuator (C) of each special cap screw, with TY9369 Low Strength Threadlocker.

4. Back screws away from ball switches and move spring loaded bracket assembly to position lever to center of neutral slot.

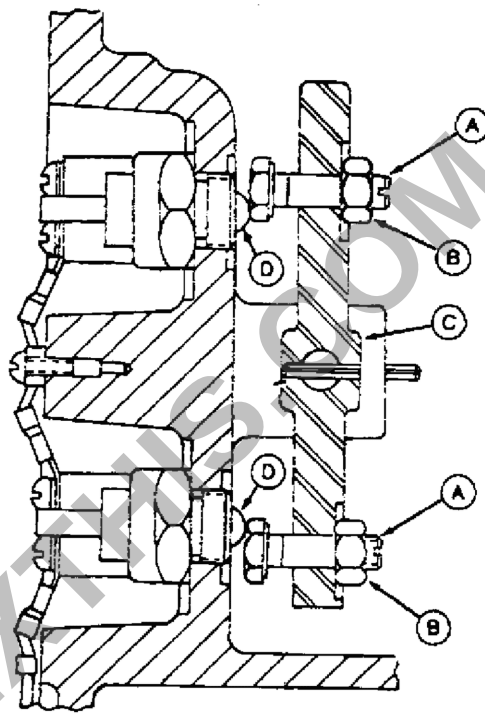
5. Turn screws in until screw contacts switch balls (D); then back out one turn.

6. Hold screws in this position. Install and tighten lock jam nuts (B).

TORQUE SPECIFICATION

Actuator Lock Nut . . . . . 11 N·m (8 lb-ft)

7. Install the selector assembly onto the brackets, connect the harnesses, install the throttle linkage, top guide and front console cover.



RW15142 -UN-03APR89

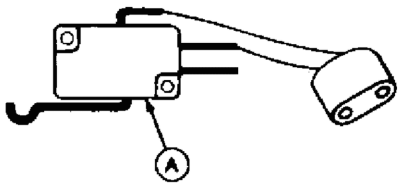
A—Special Cap Screw
B—Lock Nut
C—Actuator
D—Switch Ball

RX143424050,39 -19-11FEB92

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43

TEST PARK BRAKE WARNING CIRCUIT SWITCH

Park brake lamp and warning horn micro switch (A)—With shift lever in forward and then reverse positions, there should be continuity across the A and B terminals of switch two-way connector and no continuity with the lever in neutral.



RW17118 -UN-05DEC89

RX143424050,34 -19-17OCT89

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Steering and Brakes

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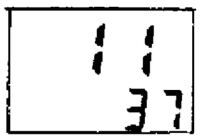
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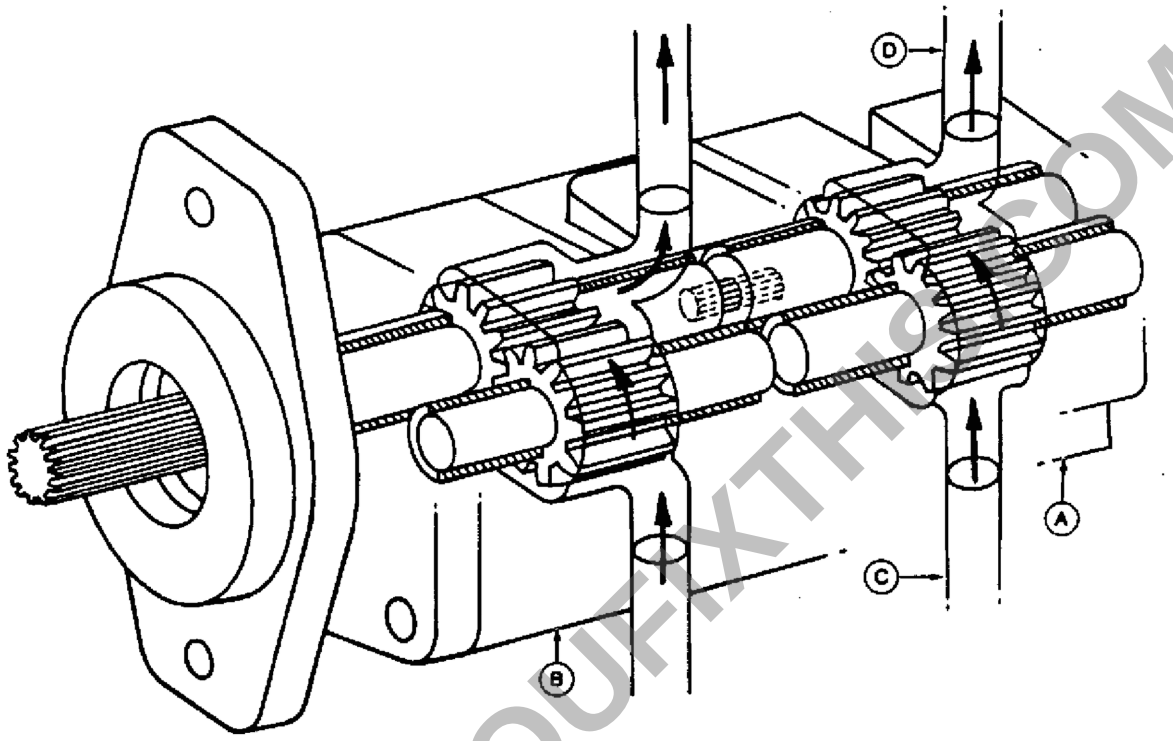
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14 **CALIBRATE PRESSURE VALVE PRELOAD**	Turn raise limit control knob full left (CCW) and then full right (CW). Hitch Movement: Up more than 1/4 but not full up.	 RW15922 -UN-15DEC88	Tach display should be between “5” and “75”. *NOTE: Tach display will change to a number above 100 and then decrease to determine the valve turn off setting. When determined, the display will change to a value below 100 and stop decreasing. The value of this number should be within + or -3 of the value in step 12.*	**OK:** GO TO **15** **NOT OK:** Tach display is “239”, GO TO Test Procedure 23. **NOT OK:** Tach display did not initially change to a number above 100, GO TO Test Procedure 9. **NOT OK:** Tach display goes below “5” or above “75” indicating a valve problem. Check valve hydraulics. **NOT OK:** Final display is not within + or -3 of the reading at step 12. Repeat steps 13 and 14. If correct results are not obtained, check the hitch hydraulic system. 27010A,1550,AB -19-09APR93
15 **PREPARE FOR LIFT CYLINDER FILL VOLUME INDEX CALIBRATION**	Pull hitch control lever full rearward. Hitch Movement: Full up.	 RW15921 -UN-15DEC88	Tach display should be “100”.	**OK:** GO TO **16** 27010A,1550,AC -19-09APR93
16 **CALIBRATE LIFT CYLINDER FILL VOLUME INDEX**	Determine size of cylinder rods used. Slowly push or pull control lever forward or rearward until tach displays the value that corresponds to the size and number of cylinders used. Value can be + or -1 of listed value.			**Continued on next page**

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AXLE/PTO DROP BOX LUBE PUMP



RW20607 -UN-03FEB92

A—Axle Lube Pump **B—Hydraulic Charge Pump** **C—Inlet from Front Axle** **D—To Rear Axle or PTO Drop Box**

Lube pump (A) is mounted on front of hydraulic charge pump (B). Pump is driven by charge pump drive shaft.

A 40—60 percent air-to-oil mixture is drawn from front axle to inlet (C). Pump provides oil for cooling and lubrication. Air is used to control oil levels.

Front gear set provides oil (D) to rear axle and, if equipped, to PTO drop box. Oil is routed to top of drop box first. Two hoses direct oil from bottom of drop box to two outer drain ports of differential housing. On tractors without PTO, oil flows directly to rear axle ports.

An axle lube relief valve downstream of the pump outlet relieves some oil to sump at cold temperature.

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27025,1550,O -19-09APR93

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