

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

January 2004

Test 1833: John Deere 7720 Powrquad Diesel 12-Speed

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 1833: John Deere 7720 Powrquad Diesel 12-Speed" (2004). *Nebraska Tractor Tests*. 2129.

<https://digitalcommons.unl.edu/tractormuseumlit/2129>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

NEBRASKA OECD TRACTOR TEST 1833—SUMMARY 425

JOHN DEERE 7720 POWRQUAD-PLUS DIESEL

20 SPEED

POWER TAKE-OFF PERFORMANCE

Power HP (kW)	Crank shaft speed rpm	Gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Mean Atmospheric Conditions
MAXIMUM POWER AND FUEL CONSUMPTION					
Rated Engine Speed—(PTO speed—1076 rpm)					
141.89 (105.81)	2099	8.15 (30.86)	0.403 (0.245)	17.41 (3.43)	
Standard Power Take-off Speed (1000 rpm)					
150.58 (112.29)	1951	8.27 (31.32)	0.386 (0.235)	18.20 (3.59)	
Maximum Power (2 hours)					
159.79 (119.16)	1650	8.48 (32.08)	0.372 (0.227)	18.85 (3.71)	

VARYING POWER AND FUEL CONSUMPTION

141.89 (105.81)	2099	8.15 (30.86)	0.403 (0.245)	17.41 (3.43)	Air temperature
123.91 (92.40)	2154	7.48 (28.31)	0.424 (0.258)	16.57 (3.26)	76°F (24°C)
93.35 (69.61)	2161	6.20 (23.45)	0.466 (0.283)	15.07 (2.97)	Relative humidity
62.63 (46.70)	2174	4.83 (18.28)	0.541 (0.329)	12.97 (2.56)	48%
31.43 (23.43)	2184	3.55 (13.42)	0.702 (0.482)	8.86 (1.75)	Barometer
1.07 (0.80)	2194	2.22 (8.41)	14.566 (8.860)	0.48 (0.09)	29.18" Hg (98.82 kPa)

Maximum Torque - 558 lb.-ft. (757 Nm) at 1402 rpm

Maximum Torque Rise - 57.2%

Torque rise at 1704 engine rpm - 39%

DRAWBAR PERFORMANCE

UNBALLASTED - FRONT DRIVE ENGAGED

FUEL CONSUMPTION CHARACTERISTICS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
Maximum Power—7th (B3) Gear									
129.08 (96.25)	10887 (48.43)	4.45 (7.16)	2095	3.74	0.442 (0.269)	15.88 (3.13)	188 (87)	59 (15)	28.85 (97.70)
75% of Pull at Maximum Power—7th (B3) Gear									
101.03 (75.34)	8173 (36.36)	4.64 (7.46)	2157	2.51	0.490 (0.298)	14.34 (2.82)	188 (87)	68 (20)	28.84 (97.66)
50% of Pull at Maximum Power—7th (B3) Gear									
68.38 (50.99)	5439 (24.19)	4.71 (7.59)	2171	1.52	0.575 (0.350)	12.21 (2.40)	184 (84)	68 (20)	28.84 (97.66)
75% of Pull at Reduced Engine Speed—10th (C2) Gear									
101.06 (75.36)	8168 (36.33)	4.64 (7.47)	1624	2.52	0.451 (0.274)	15.57 (3.07)	186 (86)	69 (21)	28.82 (97.60)
50% of Pull at Reduced Engine Speed—10th (C2) Gear									
68.64 (51.18)	5445 (24.22)	4.73 (7.61)	1638	1.50	0.503 (0.306)	13.97 (2.75)	182 (83)	69 (21)	28.82 (97.60)

Location of Test: Nebraska Tractor Test Laboratory, University of Nebraska, Lincoln, Nebraska 68583-0832

Dates of Test: March 30-April 21, 2004

Manufacturer: John Deere Tractor Works, 3500 East Donald Street, P.O. Box 270, Waterloo Ia, 50704-0270

FUEL, OIL and TIME: Fuel No. 2 Diesel Specific gravity converted to 60°/60°F (15°/15°C) 0.8432 Fuel weight 7.021 lbs/gal (0.841 kg/l) Oil SAE 15W-40 API service classification CF-4 Transmission and hydraulic lubricant John Deere Hy-Gard fluid Front axle lubricant John Dere Hy-Gard fluid Total time engine was operated: 34.5 hours

ENGINE: Make John Deere Diesel Type six cylinder vertical with turbocharger and air to air intercooler Serial No.*PE6068H315190* Crankshaft lengthwise Rated engine speed 2100 Bore and stroke 4.19" x 5.00" (106.5 mm x 127.0 mm) Compression ratio 17.0 to 1 Displacement 414 cu in (6788 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements and aspirator Oil filter one full flow cartridge Oil cooler engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil Fuel filter one paper element and prestrainer Fuel cooler radiator for pump return fuel Muffler vertical Cooling medium temperature control 2 thermostats and variable speed fan

ENGINE OPERATING PARAMETERS: Fuel rate: 55.8 - 61.3 lb/h (25.3 - 27.8 kg/h) High idle: 2175 - 2225 rpm Turbo boost: nominal 14.5-17.4 psi (100-120 kPa) as measured 15.9 psi (110 kPa)

CHASSIS: Type front wheel assist Serial No.*RW7720R010686* Tread width rear 60.0" (1524 mm) to 109.2 (2774 mm) front 60.0" (1524 mm) to 88.0" (2235 mm) Wheelbase 112.5" (2860 mm) Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial (4) range operator controlled power shift Nominal travel speeds mph (km/h) first 1.50 (2.41) second 1.80 (2.90) third 2.16 (3.48) fourth 2.65 (4.26) fifth 3.18 (5.11) sixth 3.83 (6.16) seventh 4.58 (7.37) eighth 5.06 (8.14) ninth 5.61 (9.03) tenth 6.09 (9.80) eleventh 7.29 (11.73) twelfth 8.93 (14.37) thirteenth 9.36 (15.06) fourteenth 11.27 (18.14) fifteenth 13.50 (21.72) sixteenth 13.86 (22.31) seventeenth 16.54 (26.61) eighteenth 16.70 (26.87) nineteenth 20.00 (32.18) twentieth 24.50 (39.42) reverse 1.57 (2.52), 1.88 (3.03), 2.26 (3.63), 2.77 (4.45), 3.31 (5.33), 3.99 (6.42), 4.78 (7.69), 5.28 (8.49), 5.85 (9.42), 6.35 (10.22), 7.61 (12.24), 9.32 (15.00), 9.77 (15.72), 11.76 (18.92), 14.09 (22.67), 14.47 (23.28), 17.26 (27.77), 17.42 (28.04), 20.87 (33.58), 25.56 (41.13)

DRAWBAR PERFORMANCE

UNBALLASTED - FRONT DRIVE ENGAGED-1650 RPM MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Hip.hr/gal (kW.h/l)	Temp.°F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
4th(A4)Gear									
105.42 (78.61)	16440 (73.13)	2.40 (3.87)	2152	12.33	0.516 (0.314)	13.62 (2.68)	184 (84)	49 (9)	28.79 (97.49)
5th(B1)Gear									
122.58 (91.41)	15842 (70.47)	2.90 (4.67)	2095	9.39	0.464 (0.282)	15.14 (2.98)	185 (85)	54 (12)	28.77 (97.43)
6th(B2)Gear									
133.55 (99.59)	15295 (68.04)	3.27 (5.27)	1928	7.78	0.434 (0.264)	16.19 (3.19)	187 (86)	58 (14)	28.80 (97.53)
7th(B3)Gear									
141.77 (105.72)	14790 (65.79)	3.59 (5.78)	1745	6.57	0.433 (0.263)	16.23 (3.20)	194 (90)	59 (15)	28.85 (97.70)
8th(C1)Gear									
143.31 (106.86)	14242 (63.35)	3.77 (6.07)	1649	5.86	0.416 (0.253)	16.88 (3.33)	192 (89)	58 (14)	28.85 (97.70)
9th(B4)Gear									
144.03 (107.40)	12719 (56.58)	4.25 (6.83)	1646	4.54	0.413 (0.251)	17.00 (3.35)	191 (89)	56 (13)	28.86 (97.73)
10th(C2) Gear									
144.15 (107.49)	11709 (52.08)	4.62 (7.43)	1645	4.27	0.415 (0.252)	16.94 (3.34)	193 (89)	60 (16)	28.85 (97.70)
11th(C3)Gear									
145.02 (108.14)	9735 (43.30)	5.59 (8.99)	1645	3.24	0.409 (0.249)	17.17 (3.38)	197 (92)	63 (17)	28.84 (97.66)
12th(C4) Gear									
141.66 (105.64)	7684 (34.18)	6.91 (11.13)	1648	2.39	0.421 (0.256)	16.70 (3.29)	198 (92)	64 (18)	28.84 (97.66)
13th(D1) Gear									
143.28 (106.85)	7413 (32.97)	7.25 (11.66)	1646	2.26	0.414 (0.252)	16.95 (3.34)	196 (91)	65 (18)	28.84 (97.66)
14th(D2) Gear									
140.17 (104.53)	6021 (26.78)	8.73 (14.05)	1640	1.71	0.425 (0.258)	16.53 (3.26)	201 (94)	65 (18)	28.85 (97.70)

TRACTOR SOUND LEVEL WITH CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged dB(A)
At no load in 7th (B3)gear	68.8	68.8
Transport speed- no load - 20th(E4) gear		72.7
Bystander in 20th(E4) Gear		85.5

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires - No., size, ply & psi(kPa)	Four 480/80R42;***;10(70)	Two 480/80R42;***;16(110)
Ballast - Duals (total)	1630 lb (739 kg)	None
- Cast Iron (total)	1340 lb (608 kg)	None
Front Tires - No., size, ply & psi(kPa)	Two 380/85R30;***;17(115)	Two 380/85R30;***;17(115)
Ballast - Liquid (total)	None	None
- Cast Iron (total)	600 lb (272 kg)	None
Height of Drawbar	20.5 in (520 mm)	19.5 in (495 mm)
Static Weight with operator - Rear	13270 lb (6019 kg)	10470 lb(4749 kg)
- Front	6950 lb (3152 kg)	6180 lb(2803 kg)
- Total	20220 lb (9171 kg)	16650 lb(7552 kg)

Clutch wet multiple disc hydraulically actuated by foot pedal **Brakes** wet multiple disc hydraulically operated by two foot pedals that can be locked together **Steering** hydrostatic **Power take-off** 540 rpm at 1950 engine rpm or 1000 rpm at 1950 engine rpm **Unladen tractor mass** 16475 lb (7473 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with official OECD, SAE and Nebraska test procedures. For the maximum power tests the fuel temperature at the injection pump inlet was maintained at 117°F (47°C). The pull in 3rd (A3) gear (ballasted tractor) was limited to avoid excessive tractor bouncing. The performance figures on this summary were taken from a test conducted under the OECD Code II test code procedure.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1833**, Nebraska Summary 425, July 19, 2004.

Leonard L. Bashford
Director

M.F. Kocher
V.I. Adamchuk
W.P. campbell
Board of Tractor Test Engineers

DRAWBAR PERFORMANCE
BALLASTED - FRONT DRIVE ENGAGED - 1650 RPM
MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Fuel Consumption Hp.hr/gal (kW.h/l)	Temp. °F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
3rd(A3) Gear									
111.81 (83.38)	20604 (91.65)	2.03 (3.28)	2149	8.58	0.486 (0.296)	14.44 (2.84)	182 (83)	43 (6)	28.75 (97.36)
4th(A4) Gear									
126.00 (93.96)	19536 (86.90)	2.42 (3.89)	2053	7.25	0.461 (0.281)	15.22 (3.00)	187 (86)	58 (14)	28.70 (97.19)
5th(B1) Gear									
137.28 (102.37)	18991 (84.48)	2.71 (4.36)	1906	6.63	0.434 (0.264)	16.19 (3.19)	189 (87)	63 (17)	28.69 (97.16)
6th(B2) Gear									
141.52 (105.53)	18778 (83.53)	2.83 (4.55)	1649	6.50	0.430 (0.262)	16.32 (3.21)	192 (89)	65 (18)	28.69 (97.16)
7th(B3) Gear									
145.58 (108.56)	15735 (69.99)	3.47 (5.58)	1648	4.14	0.418 (0.254)	16.80 (3.31)	193 (90)	67 (19)	28.69 (97.16)
8th(C1) Gear									
145.59 (108.56)	14161 (62.99)	3.86 (6.20)	1649	3.51	0.417 (0.254)	16.85 (3.32)	198 (92)	71 (22)	28.68 (97.12)
9th(B4) Gear									
144.94 (108.08)	12631 (56.19)	4.30 (6.92)	1648	2.94	0.420 (0.256)	16.71 (3.29)	196 (91)	69 (21)	28.68 (97.12)
10th(C2) Gear									
144.03 (107.41)	11541 (51.34)	4.68 (7.53)	1647	2.63	0.419 (0.255)	16.76 (3.30)	196 (91)	72 (22)	28.67 (97.09)
11th(C3) Gear									
144.42 (107.69)	9594 (42.68)	5.64 (9.08)	1650	2.06	0.420 (0.255)	16.73 (3.30)	197 (92)	73 (23)	28.67 (97.09)
12th(C4) Gear									
141.38 (105.43)	7644 (34.00)	6.94 (11.16)	1645	1.50	0.415 (0.252)	16.92 (3.33)	198 (92)	74 (23)	28.67 (97.09)
13th(D1) Gear									
142.34 (106.15)	7326 (32.59)	7.29 (11.73)	1648	1.38	0.417 (0.253)	16.86 (3.32)	201 (94)	74 (23)	28.67 (97.09)
14th(D2) Gear									
139.76 (104.22)	5974 (26.58)	8.77 (14.12)	1641	1.03	0.438 (0.266)	16.02 (3.16)	204 (95)	75 (24)	28.67 (97.09)

DRAWBAR PERFORMANCE
BALLASTED - FRONT DRIVE DISENGAGED
FUEL CONSUMPTION CHARACTERISTICS

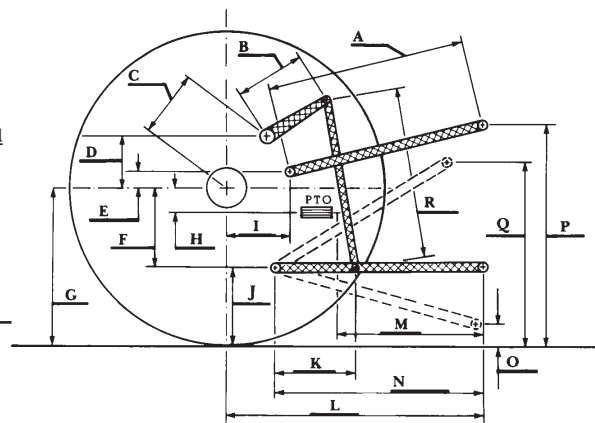
Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Fuel Consumption Hp.hr/gal (kW.h/l)	Temp.°F cool- ing med	Temp.°C Air dry bulb	Barom. inch Hg (kPa)
Maximum Power—7th(B3)Gear									
129.26 (96.39)	10916 (48.55)	4.44 (7.15)	2098	3.05	0.442 (0.269)	15.90 (3.13)	183 (84)	66 (19)	28.69 (97.16)
75% of Pull at Maximum Power—7th(B3)Gear									
99.54 (74.22)	8120 (36.12)	4.60 (7.40)	2154	2.24	0.488 (0.297)	14.39 (2.83)	187 (86)	59 (15)	28.97 (98.10)
50% of Pull at Maximum Power—7th(B3)Gear									
67.44 (50.29)	5432 (24.16)	4.66 (7.49)	2165	1.50	0.587 (0.357)	11.96 (2.36)	181 (83)	60 (16)	28.97 (98.10)
75% of Pull at Reduced Engine Speed—10th(C2) Gear									
99.92 (74.51)	8143 (36.22)	4.60 (7.41)	1622	2.23	0.455 (0.277)	15.42 (3.04)	185 (85)	61 (16)	28.97 (98.10)
50% of Pull at Reduced Engine Speed—10th(C2) Gear									
67.77 (50.54)	5436 (24.18)	4.68 (7.52)	1636	1.49	0.510 (0.310)	13.77 (2.71)	179 (82)	62 (17)	28.97 (98.10)
MAXIMUM POWER IN SELECTED GEARS									
4th(A4) Gear									
110.82 (82.64)	17189 (76.46)	2.42 (3.89)	2149	10.84	0.508 (0.309)	13.81 (2.72)	183 (84)	46 (8)	28.76 (97.39)
5th(B1) Gear									
123.83 (92.34)	15542 (69.13)	2.99 (4.81)	2112	6.56	0.460 (0.280)	15.26 (3.01)	187 (86)	61 (16)	28.70 (97.19)
6th(B2) Gear									
126.88 (94.62)	12952 (57.61)	3.67 (5.91)	2098	3.96	0.453 (0.275)	15.51 (3.06)	190 (88)	64 (18)	28.69 (97.16)
7th(B3) Gear									
129.26 (96.39)	10916 (48.55)	4.44 (7.15)	2098	3.05	0.442 (0.269)	15.90 (3.13)	183 (84)	66 (19)	28.69 (97.16)
8th(C1) Gear									
127.94 (95.41)	9742 (43.34)	4.92 (7.93)	2100	2.64	0.449 (0.273)	15.63 (3.08)	190 (88)	70 (21)	28.68 (97.12)
9th(B4) Gear									
125.05 (93.25)	8550 (38.03)	5.48 (8.83)	2098	2.27	0.456 (0.278)	15.39 (3.03)	194 (90)	68 (20)	28.69 (97.16)
10th(C2) Gear									
126.27 (94.16)	7946 (35.35)	5.96 (9.59)	2097	2.04	0.454 (0.276)	15.48 (3.05)	196 (91)	72 (22)	28.67 (97.09)
11th(C3) Gear									
126.39 (94.25)	6608 (29.39)	7.17 (11.54)	2097	1.57	0.453 (0.275)	15.51 (3.06)	195 (90)	72 (22)	28.67 (97.09)
12th(C4) Gear									
121.30 (90.45)	5175 (23.02)	8.79 (14.14)	2088	1.11	0.479 (0.291)	14.67 (2.89)	198 (92)	73 (23)	28.67 (97.09)

THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: III

Quick Attach: Yes

	<u>lift cylinders</u> 2 x 90 mm	<u>lift cylinders</u> 2 x 100 mm
Maximum Force Exerted Through Whole Range:	10109 lbs (45.0 kN)	15574 lbs (69.3 kN)
i) Opening pressure of relief valve:	NA	NA
	<u>one outlet set</u>	<u>two outlet sets combined</u>
Sustained pressure at compensator cutoff:	2850 psi (197 bar)	2845 psi (196 bar)
ii) Pump delivery rate at minimum pressure and rated engine speed:	32.1 GPM (121.4 l/min)	32.2 GPM (121.8 l/min)
iii) Pump delivery rate at maximum		
hydraulic power:	31.5 GPM (119.4 l/min)	32.1 GPM (121.6 l/min)
Delivery pressure:	2115 psi (146 bar)	2500 psi (172 bar)
Power:	38.9 HP (29.0 kW)	46.8 HP (34.9 kW)



HITCH DIMENSIONS AS TESTED—NO LOAD

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi. (bar)	2850 (197)
Location:	lift cylinders
Hydraulic oil temperature: °F (°C)	144 (62)
Location:	hydraulic sump
Category:	III
Quick attach:	No, Yes
SAE Static Test —System pressure 2610 psi (180 Bar) with lift cylinders 2 x 90 mm	
Hitch point distance to ground level in. (mm)	8.1 (205) 16.1 (410) 24.2 (614) 32.2 (818) 40.2 (1020)
Lift force on frame lb	13167 13413 13297 12171 10537
" " " " " " (kN)	(58.6) (59.7) (59.1) (54.1) (46.9)
with lift cylinders 2 x 100 mm & Quick coupler	
Hitch point distance to ground level in. (mm)	7.9 (201) 16.1 (409) 24.0 (609) 31.9 (810) 40.0 (1017)
Lift force on frame lb	18660 18544 17958 16558 14432
" " " " " " (kN)	(83.0) (82.5) (79.9) (73.7) (64.2)

	OECD test inch	mm	SAE test inch	mm
A	27.6	700	26.3	668
B	16.7	425	16.7	425
C	25.6	650	25.6	650
D	23.9	608	23.9	608
E	11.1	283	7.5	190
F	12.7	323	12.7	323
G	34.3	870	34.3	870
H	4.7	120	4.7	120
I	20.9	530	20.6	523
J	21.5	547	21.5	547
K	28.1	713	24.3	617
L	51.2	1300	47.4	1204
M	28.7	728	24.9	632
N	44.1	1120	40.3	1024
O	9.0	230	8.0	203
P	48.8	1240	43.9	1115
Q	40.3	1024	39.4	1000
R	37.0	940	37.6	955



JOHN DEERE 7720 DIESEL

Agricultural Research Division
Institute of Agriculture and Natural Resources
University of Nebraska—Lincoln
Darrell Nelson, Dean and Director