

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

2018

Test 2203: John Deere 9420RX

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 2203: John Deere 9420RX" (2018). *Nebraska Tractor Tests*. 2634.
<https://digitalcommons.unl.edu/tractormuseumlit/2634>

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 2203—SUMMARY 1153

JOHN DEERE 9420RX DIESEL

18 SPEED

POWER TAKE-OFF PERFORMANCE

Power HP (kW)	Crank shaft speed rpm	Diesel Consumption		D.E.F. Consumption		Mean Atmospheric Conditions
		Gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW/h/l)	Gal/hr (l/h)	
MAXIMUM POWER AND FUEL CONSUMPTION						
SEE NOTE 1 - PAGE 2						
Rated Engine Speed—(PTO speed—1108 rpm)						
319.74 (238.43)	2099	20.28 (76.75)	0.444 (0.270)	15.77 (3.11)	0.42 (1.61)	Fuel used during active exhaust regeneration-3.00 gal (11.37 l) (see note 2, p.2)
Standard Power Take-off Speed(1000 rpm)						
356.18 (265.60)	1895	20.51 (77.63)	0.403 (0.245)	17.37 (3.42)	0.39 (1.48)	
Maximum Power (1 hour)						
370.49 (276.27)	1700	20.14 (76.25)	0.380 (0.231)	18.39 (3.62)	0.46 (1.75)	

VARYING POWER AND FUEL CONSUMPTION

319.74 (238.43)	2099	20.28 (76.75)	0.444 (0.270)	15.77 (3.11)	0.42 (1.61)	Air temperature
278.49 (207.67)	2150	19.00 (71.94)	0.478 (0.290)	14.65 (2.89)	0.43 (1.62)	76°F (24°C)
208.77 (155.68)	2150	16.25 (61.53)	0.545 (0.331)	12.84 (2.53)	0.52 (1.96)	Relative humidity
139.21 (103.81)	2150	13.16 (49.81)	0.661 (0.402)	10.58 (2.08)	0.46 (1.75)	34%
69.70 (51.97)	2150	10.22 (38.71)	1.027 (0.624)	6.82 (1.34)	0.31 (1.16)	Barometer
3.01 (2.24)	2150	7.64 (28.93)	17.768 (10.808)	0.39 (0.08)	0.23 (0.86)	28.70" Hg (97.19 kPa)

Maximum Torque - 1241 lb-ft (1683 Nm) at 1550 rpm
 Maximum Torque Rise -55.1%
 Torque rise at 1681 engine rpm -46%
 Power increase at 1700 engine rpm - 15.9%

DRAWBAR PERFORMANCE (Unballasted) 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)	D.E.F. Consumption Hp.hr/gal (kW/h/l)	Temp. °F (°C)	Barom. inch Hg (kPa)		
							cool- ing med	Air dry bulb		
Power at Rated Engine Speed—7th Gear- Manual mode										
302.17 (225.32)	22303 (99.21)	5.08 (8.18)	2100	2.0	0.489 (0.297)	14.32 (2.82)	0.013 (0.008)	190 (88)	61 (16)	28.98 (98.14)
75% of Pull at Rated Engine Speed—7th Gear- Manual mode										
234.85 (175.12)	16679 (74.19)	5.28 (8.50)	2162	1.1	0.554 (0.337)	12.62 (2.49)	0.016 (0.010)	190 (88)	64 (18)	29.00 (98.21)
50% of Pull at Rated Engine Speed—7th Gear- Manual mode										
159.60 (119.01)	11161 (49.65)	5.36 (8.63)	2184	0.6	0.676 (0.411)	10.35 (2.04)	0.028 (0.017)	179 (81)	64 (18)	29.00 (98.21)
75% of Pull at Reduced Engine Speed—5.3 mph (8.6 km/h)-Auto mode										
234.42 (174.81)	16613 (73.90)	5.29 (8.51)	1433	1.1	0.446 (0.271)	15.68 (3.09)	0.015 (0.009)	191 (88)	65 (18)	29.00 (98.21)
50% of Pull at Reduced Engine Speed—5.3 mph (8.6 km/h)-Auto mode										
159.10 (118.64)	11225 (49.93)	5.32 (8.55)	1288	0.6	0.471 (0.286)	14.87 (2.93)	0.017 (0.010)	187 (86)	65 (18)	29.00 (98.21)

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

Dates of tests: September 18 - 28, 2018

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

CONSUMABLE Fluids, OIL and TIME: Fuel No. 2 Diesel **Specific gravity converted to 60°/60°F (15°/15°C)** 0.8404 **Fuel weight** 6.998 lbs/gal (0.839 kg/l) **Diesel Exhaust Fluid (DEF)** 32% aqueous urea solution **DEF weight** 9.071 lbs/gal (1.087 kg/l) **Oil SAE 10W-30 API service classification CJ-4** **Transmission, hydraulic and final drive lubricant** John Deere Hy-Gard fluid **Total time engine was operated:** 29.5 hours

ENGINE: Make John Deere **Diesel Type** six cylinder vertical with two turbochargers, air to air aftercooler and D.E.F.(diesel exhaust fluid) exhaust treatment **Serial No.** *RG6135U015465* **Crankshaft** lengthwise **Rated engine speed** 2100 **Bore and stroke** 5.197" x 6.496" (132.0 mm x 165.0 mm) **Compression ratio** 16.0 to 1 **Displacement** 826 cu in (13548 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 transmission/ hydraulic oil also feeding front and rear axles **Fuel filter** two paper cartridges **Fuel cooler** radiator for returned fuel **Exhaust** DOC (diesel oxidation catalyst), SCR (selective catalyst reduction) and regenerative DPF (diesel particulate filter) integrated within a vertical muffler **Cooling medium temperature control** 3 thermostats and variable speed fan

ENGINE OPERATING PARAMETERS: Fuel rate: Stationary PTO operation (395 engine hp) 137.3 - 148.8 lb/h (62.3 - 67.5 kg/h), (420 engine hp) 143.1 - 154.8 lb/h (64.9 - 70.2 kg/h) **High idle:** 2150 - 2250 rpm (2125 - 2175 rpm with PTO engaged) **Turbo boost:** (420 engine hp) nominal 27.5 - 31.9 psi (190 - 220 kPa) as measured 31.0 psi (214 kPa)

CHASSIS: Type 4WD with rubber tracks **Serial No.** *1RW9420RJJ P805292* **Track width** rear 120.0" (3048 mm) front 120.0" (3048 mm) **Wheelbase** 163.5" (4154 mm) **Length of track on ground** 72.4" (1839 mm) **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range operator controlled power shift **Nominal travel speeds mph (km/h)** first 2.50 (4.03) second 3.08 (4.96) third 3.41 (5.48) fourth 3.81 (6.13) fifth 4.19 (6.75) sixth 4.69 (7.55) seventh 5.18 (8.34) eighth 5.76 (9.27) ninth 6.38 (10.27) tenth 7.09 (11.41) eleventh 7.84 (12.61) twelfth 8.71 (14.02) thirteenth 9.64 (15.52) fourteenth 10.73 (17.26)

DRAWBAR PERFORMANCE
(Unballasted at 2100 engine rpm, Manual mode)

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)	D.E.F. Consumption lb/hp.hr (kg/kW.h)	Temp. °F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)	
					1st Gear					
270.78 (201.92)	45815 (203.80)	2.22 (3.56)	2102	11.7	0.549 (0.334)	12.75 (2.51)	0.013 (0.008)	191 (88)	59 (15)	28.92 (97.93)
					2nd Gear					
282.26 (210.48)	36989 (164.54)	2.86 (4.60)	2101	7.3	0.525 (0.319)	13.33 (2.63)	0.010 (0.006)	193 (89)	74 (24)	28.64 (96.99)
					3rd Gear					
296.27 (220.93)	34490 (153.42)	3.22 (5.18)	2099	5.5	0.501 (0.305)	13.96 (2.75)	0.009 (0.005)	192 (89)	71 (22)	28.64 (96.99)
					4th Gear					
301.25 (224.64)	30863 (137.29)	3.66 (5.89)	2100	4.0	0.490 (0.298)	14.27 (2.81)	0.009 (0.005)	190 (88)	69 (20)	28.64 (96.99)
					5th Gear					
301.79 (225.04)	27827 (123.78)	4.07 (6.54)	2102	3.1	0.491 (0.298)	14.27 (2.81)	0.009 (0.005)	190 (88)	68 (20)	28.63 (96.95)
					6th Gear					
298.60 (222.66)	24461 (108.81)	4.58 (7.37)	2100	2.4	0.497 (0.302)	14.08 (2.77)	0.011 (0.007)	190 (88)	59 (15)	28.97 (98.10)
					7th Gear					
302.17 (225.32)	22303 (99.21)	5.08 (8.18)	2100	2.0	0.489 (0.297)	14.32 (2.82)	0.013 (0.008)	190 (88)	61 (16)	28.98 (98.14)
					8th Gear					
301.53 (224.85)	19939 (88.69)	5.68 (9.13)	2100	1.6	0.492 (0.300)	14.21 (2.80)	0.013 (0.008)	189 (87)	63 (17)	28.98 (98.14)
					9th Gear					
297.94 (222.17)	17728 (78.86)	6.30 (10.14)	2100	1.2	0.498 (0.303)	14.05 (2.77)	0.013 (0.008)	190 (88)	63 (17)	28.98 (98.14)
					10th Gear					
294.38 (219.52)	15714 (69.90)	7.03 (11.31)	2101	1.0	0.502 (0.305)	13.94 (2.75)	0.014 (0.008)	190 (88)	63 (17)	29.00 (98.21)
					11th Gear					
292.17 (217.87)	14093 (62.69)	7.78 (12.51)	2100	0.8	0.504 (0.307)	13.88 (2.73)	0.011 (0.007)	195 (90)	75 (24)	28.64 (96.99)
					12th Gear					
291.68 (217.50)	12647 (56.26)	8.65 (13.92)	2098	0.7	0.505 (0.307)	13.85 (2.73)	0.011 (0.007)	197 (91)	77 (25)	28.64 (96.99)

fifteenth 13.26 (21.34) sixteenth 16.32 (26.26) seventeenth 20.04 (32.25) eighteenth 24.67 (39.70) reverse 2.50 (4.03), 3.41 (5.48), 3.81 (6.13), 5.18 (8.34), 5.76 (9.27), 7.84 (12.61) **Clutch** wet multiple disc hydraulically actuated by foot pedal **Brakes** wet multiple disc hydraulically actuated by foot pedal **Steering** hydrostatic and articulated **Power take-off** 1000 rpm at 1895 engine rpm **Unladen tractor mass** 57620 lb (26135 kg)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

NOTE 1. In stationary PTO operation, this model operates in a derated power mode. With stationary PTO operation, using FieldCruise™, an isochronous governor is utilized. All PTO tests were conducted with FieldCruise™ engaged.

NOTE 2. The manufacturer declares that the average time between active regenerations is 50 hours. A 1% power decrease was observed during the active exhaust regeneration.

REMARKS: All test results were determined from observed data obtained in accordance with official OECD, SAE and Nebraska test procedures. The performance figures on this summary were taken from a test conducted under the OECD Code 2 test procedure.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **2203**, Nebraska Summary 1153, November 29, 2018.

Roger M. Hoy
Director

M.F. Kocher
P.J. Jasa
J.D. Luck
Board of Tractor Test Engineers

TRACTOR SOUND LEVEL WITH CAB	dB(A)
At no load in 6th gear	70.7
Transport speed- no load- 18th gear	74.3
Bystander in 17th gear	89.6

Horizontal distances of drawbar hitch point behind rear wheel axis - 44.0" (1118 mm), 49.9" (1268 mm)

TRACKS AND WEIGHT

Rear tracks - no & size
Front tracks - no & size
Height of drawbar
Static weight with operator- Rear
- Front
- Total

Tested Without Ballast

2 x 18.0 in (455 mm)
2 x 18.0 in (455 mm)
20.5 in (520 mm)
25815 lb (11709 kg)
31980 lb (14506 kg)
57795 lb (26215 kg)

DRAWBAR PERFORMANCE
UNBALLASTED - AUTO MODE
(Loads based on 2100 engine rpm manual mode performance runs)
DRAWBAR POWER AT SELECTED TRAVEL SPEEDS

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)	D.E.F. Consumption lb/hp.hr (kg/kW.h)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
3.5 mph (5.6 km/h)										
295.80 (220.57)	35085 (156.06)	3.16 (5.09)	1681	5.9	0.451 (0.274)	15.52 (3.06)	0.010 (0.006)	194 (90)	74 (23)	28.64 (96.99)
3.9 mph (6.2 km/h)										
301.16 (224.58)	30487 (135.61)	3.71 (5.96)	1726	4.0	0.451 (0.274)	15.52 (3.06)	0.009 (0.006)	193 (89)	70 (21)	28.64 (96.99)
4.2 mph (6.8 km/h)										
301.60 (224.90)	27585 (122.70)	4.10 (6.60)	1713	3.1	0.449 (0.273)	15.59 (3.07)	0.008 (0.005)	192 (89)	68 (20)	28.64 (96.99)
4.7 mph (7.6 km/h)										
298.31 (222.45)	24238 (107.81)	4.62 (7.43)	1723	2.4	0.442 (0.269)	15.84 (3.12)	0.011 (0.007)	191 (88)	60 (16)	28.97 (98.10)
5.2 mph (8.4 km/h)										
302.26 (225.40)	22129 (98.43)	5.12 (8.24)	1719	2.0	0.444 (0.270)	15.76 (3.11)	0.012 (0.007)	191 (88)	62 (17)	28.98 (98.14)
5.7 mph (9.2 km/h)										
301.57 (224.88)	20092 (89.37)	5.63 (9.06)	1694	1.6	0.442 (0.269)	15.83 (3.12)	0.012 (0.007)	191 (88)	64 (18)	28.99 (98.17)
6.3 mph (10.2 km/h)										
297.24 (221.65)	17796 (79.16)	6.26 (10.07)	1878	1.3	0.466 (0.283)	15.03 (2.96)	0.011 (0.007)	189 (87)	63 (17)	28.99 (98.17)
7.1 mph (11.4 km/h)										
294.80 (219.83)	15749 (70.05)	7.02 (11.30)	1899	1.0	0.470 (0.286)	14.90 (2.93)	0.012 (0.007)	191 (88)	64 (18)	29.00 (98.21)
7.8 mph (12.6 km/h)										
292.44 (218.07)	14105 (62.74)	7.78 (12.51)	1888	0.8	0.469 (0.285)	14.93 (2.94)	0.009 (0.006)	196 (91)	76 (24)	28.64 (96.99)
8.7 mph (14.0 km/h)										
291.45 (217.33)	12640 (56.22)	8.65 (13.92)	1895	0.7	0.475 (0.289)	14.74 (2.90)	0.009 (0.006)	196 (91)	77 (25)	28.64 (96.99)

DRAWBAR PERFORMANCE
(Unballasted at 1800 ENGINE RPM, Manual mode)
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)	Hp.hr/gal (kW.h/l)	D.E.F. Consumption lb/hp.hr (kg/kW.h)	Temp.°F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
1st Gear										
270.81 (201.94)	48194 (214.38)	2.11 (3.40)	2065	14.6	0.557 (0.339)	12.56 (2.47)	0.013 (0.008)	191 (88)	59 (15)	28.92 (97.93)
2nd Gear										
306.96 (228.90)	45116 (200.69)	2.56 (4.11)	1951	11.1	0.509 (0.309)	13.76 (2.71)	0.012 (0.007)	192 (89)	58 (15)	28.93 (97.97)
3rd Gear										
322.80 (240.71)	43278 (192.51)	2.80 (4.51)	1912	10.0	0.484 (0.295)	14.44 (2.85)	0.011 (0.007)	192 (89)	58 (14)	28.95 (98.04)
4th Gear										
331.15 (246.93)	41769 (185.80)	2.97 (4.78)	1800	9.0	0.468 (0.285)	14.96 (2.95)	0.011 (0.007)	195 (90)	58 (14)	28.94 (98.00)
5th Gear										
340.05 (253.57)	38107 (169.51)	3.35 (5.38)	1800	7.0	0.459 (0.279)	15.26 (3.01)	0.010 (0.006)	192 (89)	59 (15)	28.96 (98.07)
6th Gear										
343.69 (256.29)	33759 (150.17)	3.82 (6.14)	1800	5.1	0.453 (0.275)	15.46 (3.04)	0.011 (0.007)	194 (90)	59 (15)	28.96 (98.07)
7th Gear										
350.06 (261.04)	30812 (137.06)	4.26 (6.86)	1800	4.2	0.443 (0.269)	15.81 (3.11)	0.011 (0.007)	194 (90)	59 (15)	28.97 (98.09)
8th Gear										
352.60 (262.93)	27649 (122.99)	4.78 (7.69)	1800	3.2	0.441 (0.268)	15.87 (3.13)	0.010 (0.006)	195 (90)	63 (17)	28.98 (98.14)
9th Gear										
351.12 (261.83)	24667 (109.72)	5.34 (8.59)	1800	2.4	0.443 (0.270)	15.79 (3.11)	0.010 (0.006)	194 (90)	63 (17)	28.99 (98.17)
10th Gear										
351.22 (261.90)	22103 (98.32)	5.96 (9.59)	1800	1.9	0.442 (0.269)	15.82 (3.12)	0.011 (0.007)	195 (90)	63 (17)	28.99 (98.17)
11th Gear										
350.16 (261.11)	19836 (88.23)	6.62 (10.65)	1801	1.6	0.444 (0.270)	15.77 (3.11)	0.011 (0.007)	197 (92)	63 (17)	29.00 (98.21)
12th Gear										
351.16 (261.86)	17863 (79.46)	7.38 (11.87)	1799	1.3	0.443 (0.269)	15.81 (3.11)	0.011 (0.006)	197 (91)	64 (18)	29.00 (98.21)
13th Gear										
343.18 (255.91)	15708 (69.87)	8.20 (13.19)	1801	1.0	0.454 (0.276)	15.43 (3.04)	0.011 (0.007)	198 (92)	64 (18)	29.00 (98.21)

Lugging ability in 11th gear

Crankshaft speed rpm	2100	2000	1899	1802	1700	1599	1400	1100
Pull-lbs (kN)	13911 (61.88)	16391 (72.91)	18139 (80.69)	19699 (87.62)	20611 (91.68)	21548 (95.85)	21046 (93.62)	19317 (85.93)
Increase in pull%	0	18	30	42	48	55	51	39
Power-Hp (kW)	288.34 (215.01)	322.92 (240.80)	338.47 (252.40)	348.04 (259.53)	342.82 (255.64)	336.59 (251.00)	288.03 (214.78)	208.36 (155.37)
Speed-mpH (km/h)	7.77 (12.50)	7.39 (11.89)	7.00 (11.27)	6.63 (10.66)	6.24 (10.04)	5.86 (9.43)	5.13 (8.26)	4.04 (6.50)
Slip %	0.8	1.0	1.3	1.5	1.7	1.9	1.8	1.4

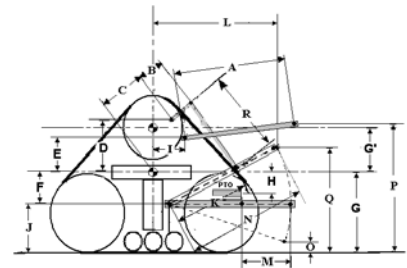
HYDRAULIC PERFORMANCE

CATEGORY: 4N/4	Category 4N	lift cylinders
Quick Attach: Yes	15648 lbs(69.6 kN)	(1 x 90 mm and 1x100 mm)
OECD Static test	20965 lbs(93.3 kN)	(2 x 110 mm)
	Category 4	Tandem pump
	15501 lbs(69.0 kN)	(1 x 90 mm and 1x100 mm)
	20527 lbs(91.3 kN)	(2 x 110 mm)
	Base pump	Tandem pump
	three outlet sets combined	three outlet sets combined
i) Sustained pressure at compensator cutoff:	2994 psi (206 bar)	2933 psi (202 bar)
ii) Pump delivery rate at minimum pressure and rated engine speed:	59.7 GPM(226.1 l/min)	56.9 GPM(215.4 l/min)
Combined flow:	116.6 GPM(441.5 l/min)	
iii) Pump delivery rate at maximum hydraulic power:	59.6 GPM(225.6 l/min)	57.2 GPM(216.5 l/min)
Delivery pressure:	2641 psi (182 bar)	2403 psi (166 bar)
Power:	91.8 HP (68.5 kW)	80.2 HP (59.8 kW)
	3/4" couplers	1/2" couplers
i) Sustained pressure at compensator cutoff:	2856 psi (197 bar)	2990 psi (206 bar)
ii) Pump delivery rate at minimum pressure and rated engine speed:	43.1 GPM(163.2 l/min)	37.3 GPM(141.3 l/min)
iii) Pump delivery rate at maximum hydraulic power:	42.5 GPM(160.9 l/min)	34.9 GPM(132.0 l/min)
Delivery pressure:	2226 psi (153 bar)	2362 psi (163 bar)
Power:	55.2 HP (41.2 kW)	48.1 HP (35.8 kW)

	Category 4N		Category 4	
	inch	mm	inch	mm
A	30.7	780	29.9	760
B	19.7	500	19.7	500
C	34.8	885	34.8	885
D	28.7	730	28.7	730
E	18.7	475	18.7	475
F	12.5	318	12.5	318
G	33.1	842	33.1	842
*G'	19.5	495	19.5	495
H	2.2	57	2.2	57
I	28.8	733	28.8	733
J	20.6	524	20.6	524
K	30.9	785	30.9	785
L	52.8	1342	52.8	1342
*L'	58.7	1491	59.6	1515
M	14.7	374	14.7	374
N	45.6	1159	45.6	1159
O	9.0	230	9.0	230
P	47.6	1210	47.6	1210
Q	40.6	1032	40.4	1027
R	49.6	1260	48.6	1260

*G' to undercarriage pivot point
*L' to Quick Attach ends

HITCH DIMENSIONS AS TESTED—NO LOAD



RECOMMENDED CITATION FORMAT:

NTTL.(2018). Nebraska OECD Tractor test 2203 for John Deere 9420RX Diesel.
Lincoln, NE:Nebraska Tractor Test Laboratory. Retrieved from <http://tractortestlab.unl.edu>



JOHN DEERE 9420RX DIESEL

Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln