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January 1998

Test 1750: Caterpillar Challenger 85E Diesel 10-Speed

Nebraska Tractor Test Lab

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NEBRASKA OECD TRACTOR TEST 1750—SUMMARY 266

CATERPILLAR CHALLENGER 85E DIESEL

10 SPEED

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

Dates of Test: May 13-June 2, 1998

Manufacturer: Caterpillar Inc., 100 N.E. Adams St., Peoria, IL 61629

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—1023 rpm)					
303.25 (226.14)	2100	16.07 (60.84)	0.374 (0.228)	18.87 (3.72)	
Standard Power Take-off Speed (1000 rpm)					
305.58 (227.87)	2054	15.99 (60.52)	0.370 (0.225)	19.11 (3.77)	
Maximum Power (2 hours)					
335.70 (250.33)	1800	16.61 (62.87)	0.349 (0.213)	20.21 (3.98)	

VARYING POWER AND FUEL CONSUMPTION

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
303.25 (226.14)	2100	16.07 (60.84)	0.374 (0.228)	18.87 (3.72)	Air temperature
265.60 (198.06)	2159	14.70 (55.64)	0.391 (0.238)	18.07 (3.56)	77°F (25°C)
205.17 (153.00)	2230	12.28 (46.47)	0.423 (0.257)	16.71 (3.29)	Relative humidity
141.14 (105.25)	2302	9.90 (37.46)	0.495 (0.301)	14.26 (2.81)	57%
70.22 (52.36)	2302	7.05 (26.69)	0.709 (0.431)	9.96 (1.96)	Barometer
1.60 (1.19)	2302	4.37 (16.56)	19.303 (11.742)	0.37 (0.07)	28.67"Hg (97.10 kPa)

Maximum Torque 1073 lb.-ft. (1455 Nm) at 1400 rpm
 Maximum Torque Rise 41.6%
 Torque rise at 1701 rpm 33%

DRAWBAR PERFORMANCE 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) cooling med	Air dry bulb (°F)	Barom. inch Hg (kPa)
Maximum Power—3rd Gear									
296.50 (221.10)	23294 (103.61)	4.77 (7.68)	2098	2.61	0.418 (0.254)	16.89 (3.33)	190 (88)	76 (24)	28.78 (97.46)
75% of Pull at Maximum Power—3rd Gear									
234.61 (174.95)	17557 (78.10)	5.01 (8.06)	2176	1.46	0.445 (0.271)	15.85 (3.12)	189 (87)	77 (25)	28.78 (97.46)
50% of Pull at Maximum Power—3rd Gear									
163.00 (121.55)	11717 (52.12)	5.22 (8.40)	2253	0.92	0.510 (0.310)	13.84 (2.73)	189 (87)	79 (26)	28.78 (97.46)
75% of Pull at Reduced Engine Speed—5th Gear									
234.74 (175.05)	17537 (78.01)	5.02 (8.08)	1662	1.51	0.397 (0.242)	17.77 (3.50)	190 (88)	78 (26)	28.78 (97.46)
50% of Pull at Reduced Engine Speed—5th Gear									
163.00 (121.55)	11772 (52.36)	5.19 (8.36)	1710	0.92	0.441 (0.268)	16.03 (3.16)	189 (87)	82 (28)	28.78 (97.46)

FUEL OIL and TIME: Fuel No. 2 Diesel Cetane No. 50.6 Specific gravity converted to 60°/60° F (15°/15°C) 0.8483 Fuel weight 7.063 lbs/gal (0.846 kg/l) Oil SAE 15W40 API service classification CG-4 Transmission and final drive lubricant SAE 30W API CD/TO-2 fluid Hydraulic lubricant Caterpillar CXP fluid Total time engine was operated 54.0 hours.

ENGINE: Make Caterpillar Diesel **Type** six cylinder vertical with turbocharger and air intercooler **Serial No.** *6AR00825* **Crankshaft** lengthwise **Rated engine speed** 2100 **Bore and stroke** (as specified) 5.118" x 5.906" (130 mm x 150 mm) **Compression ratio** 16 to 1 **Displacement** 729 cu in (11946 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 oil, radiator for hydraulic and steering oil, radiator for differential oil **Fuel filter** one cartridge and water separator **Fuel Cooler** radiator for return fuel **Muffler** vertical **Cooling medium temperature control** thermostat.

ENGINE OPERATING PARAMETERS: Fuel rate: Gears 1, 2 and neutral 106.0-117.0 lb/h (48.1-53.1 kg/h) Gears 3-10 116.2-134.5 lb/h (52.7-61.0 kg/h) **High idle:** 2260-2340 rpm **Turbo boost** nominal 19.1-25.8 psi (132-178 kPa) as measured 21.5 psi (148 kPa)

CHASSIS: Type tracklayer-rubber tracked **Serial No.** *6JS00201* **Tread width** 90.1" (2285 mm) **Length of track on ground** 107.1" (2721 mm) **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range operator controlled powershift **Nominal travel speeds mph (km/h)** first 2.79 (4.49) second 4.00 (6.44) third 4.93 (7.93) fourth 5.64 (9.08) fifth 6.45 (10.38) sixth 7.06 (11.36) seventh 8.07 (12.99) eighth 9.25 (14.89) ninth 12.54 (20.18) tenth 17.99 (28.95) reverse 2.03 (3.27), 4.71 (7.58) **Clutch** multiple wet disc hydraulically actuated by foot pedal **Brakes** caliper disc hydraulically actuated by foot pedal **Steering** differential steering hydrostatically actuated by steering wheel **Power take-off** 1000 rpm at 2050 engine rpm **Unladen tractor mass** 34895 lb (15828 kg)

**DRAWBAR PERFORMANCE AT 2100 RPM(Unballasted)
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)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
1st Gear									
221.11 (164.88)	34070 (151.55)	2.43 (3.92)	2132	13.77	0.486 (0.296)	14.54 (2.86)	189 (87)	71 (22)	28.77 (97.43)
2nd Gear									
261.77 (195.20)	25520 (113.52)	3.85 (6.19)	2097	3.38	0.430 (0.261)	16.43 (3.24)	190 (88)	73 (23)	28.77 (97.43)
3rd Gear									
296.50 (221.10)	23294 (103.61)	4.77 (7.68)	2098	2.61	0.418 (0.254)	16.89 (3.33)	190 (88)	76 (24)	28.78 (97.46)
4th Gear									
297.51 (221.85)	20232 (90.00)	5.51 (8.87)	2100	1.67	0.415 (0.252)	17.02 (3.35)	190 (88)	71 (22)	28.89 (97.83)
5th Gear									
298.08 (222.28)	17629 (78.42)	6.34 (10.20)	2098	1.46	0.417 (0.253)	16.95 (3.34)	189 (87)	73 (23)	28.89 (97.83)
6th Gear									
296.14 (220.83)	16022 (71.27)	6.93 (11.16)	2095	1.19	0.418 (0.254)	16.91 (3.33)	189 (87)	74 (23)	28.89 (97.83)
7th Gear									
295.15 (220.10)	13940 (62.01)	7.94 (12.78)	2095	1.03	0.420 (0.256)	16.80 (3.31)	190 (88)	73 (23)	28.80 (97.53)
8th Gear									
290.89 (216.91)	11942 (53.12)	9.13 (14.70)	2098	0.98	0.428 (0.260)	16.51 (3.25)	190 (88)	75 (24)	28.77 (97.43)

**DRAWBAR PERFORMANCE AT 1900 RPM (Unballasted)
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)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
1st Gear									
219.85 (163.94)	33756 (150.15)	2.44 (3.93)	2133	13.52	0.489 (0.297)	14.45 (2.85)	189 (87)	71 (22)	28.77 (97.43)
2nd Gear									
278.68 (207.81)	30751 (136.78)	3.40 (5.47)	1929	7.23	0.422 (0.257)	16.75 (3.30)	190 (88)	73 (23)	28.78 (97.46)
3rd Gear									
316.28 (235.85)	28351 (126.11)	4.18 (6.73)	1902	5.85	0.412 (0.251)	17.14 (3.38)	190 (88)	77 (25)	28.79 (97.49)
4th Gear									
325.57 (242.78)	24718 (109.95)	4.94 (7.95)	1905	2.86	0.399 (0.243)	17.71 (3.49)	190 (88)	72 (22)	28.89 (97.83)
5th Gear									
326.71 (243.63)	21489 (95.59)	5.70 (9.18)	1899	2.03	0.398 (0.242)	17.74 (3.50)	190 (88)	74 (23)	28.89 (97.83)
6th Gear									
325.56 (242.77)	19488 (86.68)	6.26 (10.08)	1902	1.72	0.398 (0.242)	17.73 (3.49)	190 (88)	75 (24)	28.90 (97.87)
7th Gear									
326.36 (243.37)	17029 (75.75)	7.19 (11.57)	1901	1.25	0.396 (0.241)	17.81 (3.51)	191 (88)	74 (23)	28.79 (97.49)
8th Gear									
322.11 (240.20)	14605 (64.96)	8.27 (13.31)	1903	1.14	0.404 (0.246)	17.48 (3.44)	191 (88)	76 (24)	28.78 (97.46)

TRACTOR SOUND LEVEL WITH CAB

dB(A)

At 75% load in 6th gear	76.1
Bystander	—

TRACKS, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Track Width—	30.0 in (760 mm)	30.0 in (760 mm)
Ballast—Cast Iron—Front	2150 lb (975 kg)	none
—Center	none	none
—Rear	1510 lb (685 kg)	none
Height of Drawbar	18.5 in (470 mm)	18.5 in (470 mm)
Static Weight with operator	38730 lb (17568 kg)	35070 lb (15908 kg)

REPAIRS AND ADJUSTMENTS: The PTO reduction box failed during the PTO tests at the high power setting. The reduction box was replaced and the test continued.

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 of the returned fuel was maintained at 146° F (63°C). Water was used to cool the PTO reduction box during the PTO test sequence. The performance figures on this summary were taken from a test conducted under the OECD Code II test procedure.

NOTE: The Challenger 85E engine is electronically controlled to give 2 different power levels depending on gear selection. The engine produces 292 PTO Hp when the transmission is in neutral, first and second gear. The engine produces 323 PTO Hp in third through tenth gear.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1750**, Summary 266, June 24, 1998.

LEONARD L. BASHFORD

Director

M. F. KOCHER

R. D. GRISSO

G.J. HOFFMAN

Board of Tractor Test Engineers

DRAWBAR PERFORMANCE AT 2100 RPM

(Unballasted-Special Application Tracks) MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inch Hg (kPa)
					lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	cool- ing med	Air dry bulb	
1st Gear									
234.11 (174.58)	36140 (160.76)	2.43 (3.91)	2115	12.85	0.474 (0.288)	14.90 (2.94)	189 (87)	63 (17)	28.78 (97.46)
2nd Gear									
261.57 (195.06)	25779 (114.67)	3.81 (6.12)	2100	4.21	0.432 (0.263)	16.33 (3.22)	189 (87)	70 (21)	28.71 (97.22)
3rd Gear									
295.25 (220.17)	23449 (104.30)	4.72 (7.60)	2098	3.35	0.419 (0.255)	16.86 (3.32)	189 (87)	72 (22)	28.69 (97.16)
4th Gear									
296.84 (221.35)	20432 (90.88)	5.45 (8.77)	2098	2.48	0.416 (0.253)	16.99 (3.35)	190 (88)	74 (23)	28.67 (97.09)
5th Gear									
295.99 (220.72)	17657 (78.54)	6.29 (10.12)	2098	1.91	0.417 (0.254)	16.93 (3.34)	190 (88)	76 (24)	28.65 (97.02)
6th Gear									
291.33 (217.24)	15847 (70.49)	6.89 (11.09)	2100	1.65	0.422 (0.257)	16.72 (3.29)	190 (88)	78 (26)	28.63 (96.95)
7th Gear									
293.51 (218.87)	13932 (61.97)	7.90 (12.71)	2098	1.38	0.419 (0.255)	16.85 (3.32)	190 (88)	80 (27)	28.61 (96.88)
8th Gear									
288.42 (215.07)	11914 (53.00)	9.08 (14.61)	2096	1.12	0.429 (0.261)	16.47 (3.24)	190 (88)	82 (28)	28.61 (96.88)

DRAWBAR PERFORMANCE AT 1900 RPM

(Unballasted-Special Application Tracks) MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inch Hg (kPa)
					lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	cool- ing med	Air dry bulb	
1st Gear									
226.88 (169.19)	35062 (155.96)	2.43 (3.91)	2126	13.43	0.480 (0.292)	14.71 (2.90)	189 (87)	69 (21)	28.72 (97.26)
2nd Gear									
278.72 (207.84)	31174 (138.67)	3.35 (5.40)	1918	7.57	0.421 (0.256)	16.77 (3.30)	190 (88)	71 (22)	28.70 (97.19)
3rd Gear									
318.78 (237.72)	28625 (127.33)	4.18 (6.72)	1901	5.63	0.409 (0.249)	17.25 (3.40)	190 (88)	74 (23)	28.68 (97.12)
4th Gear									
321.42 (239.68)	24793 (110.28)	4.86 (7.82)	1898	3.59	0.404 (0.246)	17.48 (3.44)	190 (88)	75 (24)	28.66 (97.05)
5th Gear									
325.39 (242.64)	21671 (96.40)	5.63 (9.06)	1897	2.89	0.400 (0.243)	17.65 (3.48)	190 (88)	77 (25)	28.64 (96.99)
6th Gear									
323.71 (241.39)	19643 (87.37)	6.18 (9.95)	1896	2.43	0.401 (0.244)	17.61 (3.47)	191 (88)	79 (26)	28.61 (96.88)
7th Gear									
323.90 (241.53)	17080 (75.97)	7.11 (11.44)	1899	1.91	0.400 (0.243)	17.66 (3.48)	191 (88)	81 (27)	28.61 (96.88)
8th Gear									
321.39 (239.66)	14676 (65.28)	8.21 (13.22)	1904	1.44	0.403 (0.245)	17.51 (3.45)	190 (88)	83 (28)	28.62 (96.92)

DRAWBAR PERFORMANCE AT 2100 RPM (Ballasted)
MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inch Hg (kPa)
					lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	cool- ing med	Air dry bulb	
1st Gear									
234.06 (174.54)	36708 (163.28)	2.39 (3.85)	2106	14.61	0.480 (0.292)	14.73 (2.90)	190 (88)	65 (18)	28.92 (97.93)
2nd Gear									
261.64 (195.10)	25237 (112.26)	3.89 (6.26)	2098	2.62	0.432 (0.263)	16.34 (3.22)	190 (88)	66 (19)	28.93 (97.97)
3rd Gear									
298.80 (222.81)	23315 (103.71)	4.81 (7.73)	2096	2.09	0.416 (0.253)	16.97 (3.34)	189 (87)	68 (20)	28.93 (97.97)
4th Gear									
295.50 (220.36)	20049 (89.18)	5.53 (8.90)	2098	1.73	0.419 (0.255)	16.87 (3.32)	190 (88)	69 (21)	28.94 (98.00)
5th Gear									
295.99 (220.72)	17445 (77.60)	6.36 (10.24)	2100	1.46	0.415 (0.252)	17.00 (3.35)	190 (88)	75 (24)	28.93 (97.97)
6th Gear									
292.35 (218.01)	15773 (70.16)	6.95 (11.19)	2097	1.36	0.426 (0.259)	16.60 (3.27)	189 (87)	72 (22)	28.92 (97.93)
7th Gear									
291.25 (217.18)	13714 (61.00)	7.96 (12.82)	2098	1.14	0.426 (0.259)	16.58 (3.27)	189 (87)	73 (23)	28.92 (97.93)
8th Gear									
288.52 (215.15)	11841 (52.67)	9.14 (14.70)	2095	1.04	0.431 (0.262)	16.37 (3.23)	190 (88)	74 (23)	28.92 (97.93)

DRAWBAR PERFORMANCE AT 1900 RPM (Ballasted)
MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption		Temp. °F (°C)		Barom. inch Hg (kPa)
					lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	cool- ing med	Air dry bulb	
1st Gear									
230.58 (171.94)	36108 (160.62)	2.39 (3.85)	2110	14.69	0.483 (0.294)	14.62 (2.88)	190 (88)	65 (18)	28.92 (97.93)
2nd Gear									
283.80 (211.63)	30983 (137.82)	3.43 (5.53)	1911	5.53	0.414 (0.252)	17.06 (3.36)	190 (88)	67 (19)	28.93 (97.97)
3rd Gear									
322.88 (240.77)	28193 (125.41)	4.29 (6.91)	1905	3.74	0.405 (0.246)	17.46 (3.44)	190 (88)	68 (20)	28.93 (97.97)
4th Gear									
324.72 (242.14)	24548 (109.19)	4.96 (7.98)	1900	2.51	0.401 (0.244)	17.62 (3.47)	191 (88)	69 (21)	28.94 (98.00)
5th Gear									
327.10 (234.92)	21417 (95.27)	5.73 (9.22)	1901	1.94	0.398 (0.242)	17.77 (3.50)	191 (88)	75 (24)	28.93 (97.97)
6th Gear									
323.63 (241.33)	19314 (85.91)	6.28 (10.11)	1903	1.73	0.402 (0.244)	17.58 (3.46)	190 (88)	72 (22)	28.92 (97.93)
7th Gear									
323.04 (240.89)	16843 (74.92)	7.19 (11.58)	1899	1.41	0.402 (0.245)	17.57 (3.46)	191 (88)	74 (23)	28.92 (97.93)
8th Gear									
321.89 (240.04)	14600 (64.94)	8.27 (13.31)	1900	1.25	0.404 (0.246)	17.48 (3.44)	191 (88)	75 (24)	28.93 (97.97)

NEBRASKA OECD TRACTOR TEST 1750—SUMMARY 266

CATERPILLAR CHALLENGER 85E DIESEL

10 SPEED

POWER TAKE-OFF PERFORMANCE (HIGH POWER SETTING)

Power HP (kW)	Crank shaft speed rpm	Gal/hr (l/h)	lb/hp.hr (kg/kWh)	Hp.hr/gal (kW.h/l)	Mean Atmospheric Conditions
MAXIMUM POWER AND FUEL CONSUMPTION					
Rated Engine Speed—(PTO speed—1023 rpm)					
339.36 (253.06)	2100	17.60 (66.61)	0.366 (0.223)	19.28 (3.80)	
Standard Power Take-off Speed (1000 rpm)					
348.75 (260.06)	2054	17.84 (67.53)	0.361 (0.220)	19.55 (3.85)	
Maximum Power (2 hours)					
372.32 (277.64)	1899	18.56 (70.26)	0.352 (0.214)	20.06 (3.95)	
VARYING POWER AND FUEL CONSUMPTION					
339.36 (253.06)	2100	17.60 (66.61)	0.366 (0.223)	19.28 (3.80)	Air temperature
295.10 (220.06)	2149	15.80 (59.80)	0.378 (0.230)	18.68 (3.68)	79°F (26°C)
228.31 (170.25)	2220	13.21 (50.01)	0.409 (0.248)	17.28 (3.40)	Relative humidity
157.41 (117.38)	2297	10.58 (40.04)	0.475 (0.289)	14.88 (2.93)	68%
78.87 (58.81)	2302	7.39 (27.98)	0.662 (0.403)	10.67 (2.10)	Barometer
2.13 (1.59)	2302	4.33 (16.40)	14.337 (8.721)	0.49 (0.10)	28.73"Hg (97.30 kPa)

Maximum Torque 1191 lb.-ft. (1614 Nm) at 1397 rpm

Maximum Torque Rise 40.5%

Torque rise at 1697 rpm 32%

This tractor model operates at two power levels. A high power setting (323 PTO Hp) is available in gears 3 through 10. To comply with test code rules an override system was used to allow that power setting to be transmitted through the PTO gears.

THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: No 3 Point Hitch Available

Quick Attach: NA

Maximum Force Exerted Through Whole Range:

NA

i) Opening pressure of relief valve:

NA

Sustained pressure with pump stalled:

2930 psi (202 bar)

ii) Pump delivery rate at minimum pressure and rated engine speed:

41.4 GPM (156.7 l/min)

iii) Pump delivery rate at maximum

hydraulic power:

38.9 GPM (147.3 l/min)

Delivery pressure:

2630 psi (181 bar)

Power:

59.7 HP (44.5 kW)



CATERPILLAR CHALLENGER 85E DIESEL

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