

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

---

10-13-1967

## Test 964: Allis-Chalmers 180 (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto: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 964: Allis-Chalmers 180 (Diesel)" (1967). *Nebraska Tractor Tests*. 1326. <https://digitalcommons.unl.edu/tractormuseumlit/1326>

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 TRACTOR TEST 964 – ALLIS-CHALMERS 180 DIESEL

## POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption		Temperature Degrees F				Barometer inches of Mercury	
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
64.01	2000	4.199	0.458	15.24	185	58	76	29.213	
Standard Power Take-off Speed (540 rpm)—One Hour									
63.90	1964	4.173	0.456	15.31	186	58	75	29.210	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
58.07	2134	4.023	0.484	14.43	182	57	75	.....	
0.00	2226	1.436	.....	.....	173	56	73	.....	
29.73	2184	2.669	0.627	11.14	178	57	75	.....	
63.78	2000	4.191	0.459	15.22	186	56	74	.....	
15.01	2207	1.995	0.927	7.52	175	56	74	.....	
44.04	2161	3.426	0.543	12.85	180	57	74	.....	
Av	35.11	2152	2.957	0.588	11.87	179	57	74	29.177

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption		Temp Degrees F				Barom-eter inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cool-ing med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
55.28	4956	4.18	1999	7.44	4.237	0.535	13.05	182	53	68	29.085
75% of Pull at Maximum Power—Ten Hours—4th Gear											
46.19	3759	4.61	2149	5.20	3.795	0.573	12.17	180	43	50	28.898
50% of Pull at Maximum Power—Two Hours—4th Gear											
32.02	2536	4.74	2174	3.56	3.038	0.662	10.54	168	42	48	28.990
MAXIMUM POWER WITH BALLAST											
51.63	7776	2.49	2075	14.86	2nd Gear .....			172	50	61	29.080
54.44	6326	3.23	1999	10.44	3rd Gear .....			172	50	61	29.080
56.81	5107	4.17	2002	7.95	4th Gear .....			173	50	61	29.080
55.70	4217	4.95	2001	6.28	5th Gear .....			178	53	68	29.070
56.44	3353	6.31	2001	4.81	6th Gear .....			179	53	68	29.070
52.99	1787	11.12	2000	2.55	7th Gear .....			179	53	68	29.070
50.84	1354	14.08	2002	1.80	8th Gear .....			179	53	68	29.070
MAXIMUM PULL WITHOUT BALLAST											
50.69	4525	4.20	2132	14.85	4th Gear .....			180	35	37	28.990
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear											
Pounds pull				5107	5469	5769	5982	5974	5842		
Horsepower				56.81	54.41	50.78	46.03	39.34	32.27		
Crankshaft speed rpm				2002	1802	1608	1410	1208	1010		
Miles per hour				4.17	3.73	3.30	2.89	2.47	2.07		
Slip of drivers %				7.95	8.50	9.21	9.56	9.68	9.56		

TIRES, BALLAST and WEIGHT		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 18.4-28; 6; 16	Two 18.4-28; 6; 16
Ballast	—Liquid	880 lb each	None
	Cast iron	1000 lb each	None
Front tire	—No, size, ply & psi	Two 7.50-16; 6; 28	Two 7.50-16; 6; 28
Ballast	—Liquid	None	None
	Cast iron	None	None
Height of drawbar		19½ inches	21 inches
Static weight with operator—Rear		8090 lb	4330 lb
Front		2210 lb	2180 lb
Total		10300 lb	6510 lb

Department of Agricultural Engineering

Dates of Test: October 13 to October 27, 1967

Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, MILWAUKEE, WISCONSIN

**FUEL, OIL and TIME** Fuel No 2 Diesel Cetane 54.7 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8382 Weight per gallon 6.979 lb Oil SAE 30 API service classification DS To motor 2.104 gal Drained from motor 1.963 gal Transmission and final-drive lubricant Allis-Chalmers special lube oil Total time engine was operated 48½ hours.

**ENGINE** Make Allis-Chalmers Diesel Type 6 cylinder vertical Serial No 2D-14839 Crankshaft mounted lengthwise Rated rpm 2000 Bore and stroke 3⅞" x 4¼" Compression ratio 16.25 to 1 Displacement 301 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable pleated paper element Oil filter full flow replaceable pleated paper cartridge Fuel filter one sediment bowl and one dual media replaceable cartridge Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No 1211-D Tread width rear 58" to 82" front 53" to 73" Wheel base 99.158" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 36.7" Vertical distance above roadway 29.0" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system constant running Transmission selective gear fixed ratio plus operator controlled partial range power shifting Advertised speeds mph first 2.3 second 2.9 third 3.7 fourth 4.6 fifth 5.4 sixth 6.7 seventh 11.6 eighth 14.5 reverse 3.3 and 4.2 Clutch single plate dry disc operated by foot pedal Brakes contracting band and disc operated by two foot pedals Steering hydraulic with power assist Turning radius (on concrete surface with brake applied) right 123" left 123" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 261" left 261" (on concrete surface without brake) right 292" left 292" Belt pulley 1678 rpm at 2000 engine rpm diam 9.00" face 6.56" Belt speed 3952 fpm Power take-off 540 rpm at 1963 engine rpm.

**REPAIRS and ADJUSTMENTS** No repairs or adjustments.

**REMARKS** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code.

First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 964.

L. F. LARSEN  
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman  
J. J. SULEK  
D. E. LANE  
Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station  
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

# EXPLANATION OF TEST REPORT

## GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

## PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

## BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  of the 85% torque; maximum power,  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

## DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of

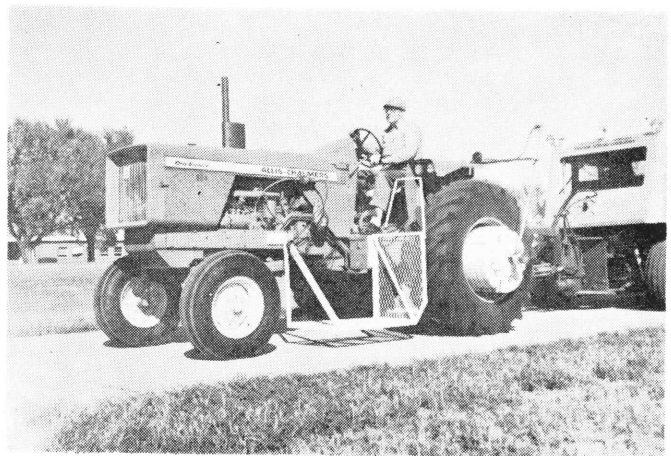
speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Pull without Ballast.** All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



ALLIS-CHALMERS 180 DIESEL