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## Test 819: Farmall 504 (Gasoline)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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# NEBRASKA TRACTOR TEST 819 - FARMALL 504 GASOLINE

The University of Nebraska Agricultural Experiment Station

E. F. Frolik, Dean; H. H. Kramer, Director, Lincoln, Nebraska

## POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Hp-hr per gal	Temperature Degrees F			Barometer inches of Mercury
		Gal per hr	Lb per hp-hr		Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
46.20	2200	3.747	0.496	12.33	178	65	75	28.905
Standard Power Take-off Speed (540 rpm)—One Hour								
44.05	1970	3.630	0.504	12.13	177	65	75	28.910
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
40.84	2289	3.515	0.527	11.62	176	65	75	.....
0.00	2453	1.427	.....	.....	166	65	75	.....
20.99	2353	2.466	0.719	8.51	174	65	75	.....
46.84	2201	3.765	0.492	12.44	176	65	76	.....
10.81	2420	1.946	1.102	5.55	170	64	74	.....
30.93	2310	2.971	0.588	10.41	179	65	75	.....
Av 25.07	2338	2.682	0.655	9.35	174	65	75	28.920

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer 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—3rd Gear											
40.41	2787	5.44	2196	4.43	3.696	0.560	10.93	180	64	71	28.720
75% of Pull at Maximum Power—Ten Hours—3rd Gear											
32.70	2129	5.76	2295	3.21	3.305	0.618	9.89	178	67	74	28.702
50% of Pull at Maximum Power—Two Hours—3rd Gear											
22.33	1415	5.92	2337	2.32	2.754	0.755	8.11	177	65	71	28.710
MAXIMUM POWER WITH BALLAST											
29.02	6111	1.78	2294	13.83	1st Gear .....			176	62	81	28.760
40.80	3855	3.97	2201	6.15	2nd Gear .....			178	60	67	28.750
41.30	2839	5.46	2205	4.67	3rd Gear .....			176	59	65	28.760
41.04	1965	7.83	2201	3.06	4th Gear .....			176	60	67	28.750
38.63	5643	2.57	2199	9.91	2nd Gear Torq. Amp.			176	62	74	28.730
40.03	4176	3.59	2202	6.61	3rd Gear Torq. Amp.			178	62	74	28.730
40.16	2894	5.20	2198	4.60	4th Gear Torq. Amp.			175	60	67	28.750
39.54	1258	11.79	2199	1.99	5th Gear Torq. Amp.			175	62	74	28.730
MAXIMUM POWER WITHOUT BALLAST											
39.92	2785	5.38	2199	7.22	3rd Gear .....			180	65	76	28.510
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—3rd Gear											
Pounds pull			2839	3035	3014	2953	2908	2940	2910		
Horsepower			41.30	39.51	35.04	30.05	25.12	21.36	16.66		
Miles per hour			5.46	4.88	4.36	3.82	3.24	2.73	2.15		
Slip of Drivers, %			4.67	4.80	4.80	4.67	4.67	4.67	4.67		

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-38; 6; 16	Two 13.6-38; 6; 14
Ballast	—Liquid	807 lb each	None
	—Cast iron	288 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 4; 28	Two 6.00-16; 4; 28
Ballast	—Liquid	None	None
	—Cast iron	197 lb each	None
Height of drawbar		20 inches	21 inches
Static weight	—Rear	5950 lb	3760 lb
	—Front	1745 lb	1350 lb
Total weight with operator		7870 lb	5285 lb

Department of Agricultural Engineering

Dates of Test: May 17 to June 6, 1962

Manufacturer: INTERNATIONAL HARVESTER COMPANY, CHICAGO, ILLINOIS  
Manufacturer's Power Rating: Not Rated

**FUEL, OIL and TIME** Fuel Regular gasoline Octane No Motor 84.6 Research 92.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7351 Weight per gallon 6.119 lb Oil SAE 10W-30 API service classification MS To Motor 1.470 gal Drained from motor 0.863 gal Transmission and final-drive lubricant I.H. Hy-Tran Fluid Total time engine was operated 43½ hours.

**ENGINE** Make International gasoline Type 4 cylinder vertical Serial No C-153-2147 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 3⅜" x 4¼" Compression ratio 7.70 to 1 Displacement 152.1 cu in Carburetor size 1¼" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner oil washed wire mesh Oil filter replaceable treated paper element Oil cooler radiator for hydraulic and transmission oil Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type Tricycle Serial No 1435 S-Y Tread width rear 52" to 84" front 8" and 14" Wheel base 89.0" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 22.9" Vertical distance above roadway 32.4" Horizontal distance from center of rear wheel tread 0.0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio plus partial range operator controlled power shifting Advertised speeds mph first 1.96 second 4.18 third 5.64 fourth 7.99 fifth 17.64 reverse 2.42 (Using T.A.) first 1.32 second 2.82 third 3.81 fourth 5.39 fifth 11.90 reverse 1.64 Clutch single plate dry disc operated by foot pedal Brakes disc brakes operated by two foot pedals which can be locked together Steering power assisted Turning radius (on concrete surface with brake applied) right 98.5" left 98.5" (on concrete surface without brake) right 100" left 100" Turning space diameter (on concrete surface with brake applied) right 206" left 206" (on concrete surface without brake) right 209.5" left 209.5" Belt pulley 1168 rpm at 2200 engine rpm diam 11" face 7.5" Belt speed 3363 fpm Power take-off 548 rpm at 2000 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 Torque Amplifier was not run as it was necessary to limit the pull in first gear direct drive.

Fifth gear direct drive was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 819.

L. F. LARSEN  
Engineer-in-Charge

L. W. HURLBUT  
G. W. STEINBRUEGGE  
J. J. SULEK  
Board of Tractor Test Engineers

# 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,  $\frac{1}{2}$  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 trans-

mission, 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 Power Without Ballast.** All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

**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.



Farmall 504 Gasoline