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## Test 703: Ford Model 881-L (LPG)

Nebraska Tractor Test Lab

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

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# NEBRASKA TRACTOR TEST 703 – FORD 881-L (LPG)

University of Nebraska Agricultural Experiment Station

W. V. Lambert, Director, Lincoln, Nebraska

## POWER TAKE-OFF PERFORMANCE

Hp	Crank shaft speed rpm	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Temperature Degrees F Air wet bulb	Air dry bulb	Barometer inches of Mercury
<b>MAXIMUM POWER AND FUEL CONSUMPTION</b>								
<b>Rated Engine Speed—Two Hours</b>								
43.61	2200	5.001	0.487	8.72	156	70	75	28.883
<b>Standard Power Take-Off Speed (1000 rpm)—One Hour</b>								
39.31	1731	4.405	0.476	8.92	154	70	75	28.943
<b>VARYING POWER AND FUEL CONSUMPTION—TWO HOURS</b>								
39.43	2342	4.991	0.538	7.90	149	70	74	.....
4.16	2438	1.864	1.904	2.23	134	69	73	.....
20.17	2391	3.593	0.757	5.61	141	69	73	.....
43.89	2201	5.096	0.494	8.61	157	69	74	.....
10.22	2423	2.379	0.989	4.30	137	70	78	.....
29.77	2357	4.391	0.627	6.78	149	70	78	.....
Av	24.61	2359	3.719	0.642	6.62	145	69	75 28.882

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	Fuel Consumption Gal per hr	Lb per hp-hr	Hp-hr per gal	Temp Cool-ing med	Degrees F Air wet bulb	Air dry bulb	Barometer inches of Mercury
<b>VARYING DRAWBAR POWER &amp; FUEL CONSUMPTION WITH BALLAST</b>											
<b>Maximum Available Power—Two Hours—6th Gear</b>											
34.28	3076	4.18	2000	7.89	4.689	0.581	7.31	161	76	87	28.825
<b>75% of Pull at Maximum Power—Ten Hours—6th Gear</b>											
29.37	2373	4.64	2168	5.76	4.557	0.659	6.45	151	74	83	28.998
<b>50% of Pull at Maximum Power—Two Hours—6th Gear</b>											
20.80	1615	4.83	2209	3.78	3.792	0.775	5.49	143	75	89	28.985
<b>MAXIMUM POWER WITH BALLAST</b>											
27.40	5131	2.00	2125	14.77	4th Gear	.....	153	74	82	28.860	.....
34.55	4123	3.14	1998	11.01	5th Gear	.....	156	76	85	28.850	.....
34.97	3161	4.15	2002	8.66	6th Gear	.....	154	76	85	28.850	.....
34.64	2677	4.85	1998	7.17	7th Gear	.....	155	75	87	28.885	.....
34.95	2062	6.36	1998	5.63	8th Gear	.....	156	75	87	28.885	.....
34.03	1213	10.52	2002	3.45	9th Gear	.....	157	76	87	28.830	.....
<b>MAXIMUM POWER WITHOUT BALLAST</b>											
33.76	3038	4.17	2105	14.46	6th Gear	.....	169	73	82	28.835	.....
<b>VARYING DRAWBAR PULL &amp; TRAVEL SPEED WITH BALLAST—6th Gear</b>											
Pounds pull			3150	3350	3500	3550	3500	3350			
Horsepower			35.0	33.1	30.8	27.5	23.3	18.8			
Miles per hour			4.2	3.7	3.3	2.9	2.5	2.1			

<b>TIRES, BALLAST and WEIGHT</b>		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-28;4;14	Two 13.6-28;4;14
Ballast	—Liquid	250 lb each	None
	—Cast iron	1094 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16;4;32	Two 6.00-16;4;28
Ballast	—Liquid	48 lb each	None
	—Cast iron	242 lb each	None
Height of drawbar		22 inches	23½ inches
Static weight	—Rear	4795 lb	2108 lb
	—Front	1980 lb	1400 lb
Total weight with operator		6950 lb	3683 lb

Department of Agricultural Engineering

Dates of Test: June 16 to June 24, 1959

Manufacturer: FORD MOTOR COMPANY, BIRMINGHAM, MICHIGAN

Manufacturer's Power Rating: Not Rated

**FUEL, OIL and TIME** Fuel commercial propane Specific gravity converted to 60°/60° 0.5103 Weight per gallon 4.25 lb Oil SAE 20-20W API service classification MS and DG To motor 1.157 gal Drained from motor 0.815 gal Transmission and final-drive lubricant Ford hydraulic oil M-2C-41 Total time motor was operated 42½ hours.

**ENGINE Make** Ford LPG Type 4 cylinder vertical Serial No 68250 Crankshaft mounted lengthwise Rated rpm 2200 PTO and belt 2000 drawbar Lubrication pressure Bore and stroke 3.90" x 3.60" Compression ratio 8.65 to 1 Displacement 172 cu in Carburetor size 1" Ignition system battery Cranking system 6 volt battery Air cleaner oil washed wire mesh Muffler was used Oil filter full flow with replaceable paper element Cooling medium temperature control thermostat.

**CHASSIS Type** standard Serial No 68250 Tread width rear 52" to 76" front 52" to 80" Wheel base 74.5" 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 31" Vertical distance above roadway 27" Horizontal distance from center of rear wheel tread 0" to the right or left Hydraulic control system direct engine drive Transmission manually controlled hydraulically actuated planetary gear Advertised speeds mph first 1.06 second 1.51 third 1.58 fourth 2.25 fifth 3.58 sixth 4.61 seventh 5.30 eighth 6.81 ninth 11.04 tenth 16.36 reverse 3.16 and 4.67 Belt pulley diam 9" face 6½" rpm 1298 and 2382 Belt speed 3058 and 5613 fpm Clutch 3 multiple disc wet clutches hydraulically operated Brakes internal expanding shoes operated by two foot pedals on right side of tractor Power take-off 540 or 1000 rpm at 1750 engine rpm Steering power assisted Turning radius (on concrete surface with brake applied) right 107" left 107" (on concrete surface without brake) right 118" left 118" Turning space diameter (on concrete surface with brake applied) right 217" left 217" (on concrete surface without brake) right 246" left 246".

**REPAIRS AND ADJUSTMENTS** The fan belt was tightened during the varying power run on the PTO.

**REMARKS** All test results were determined from observed data obtained in accordance with SAE and ASAE test code. First, second and third gears were not run as it was necessary to limit the pull in fourth gear to avoid excessive wheel slippage. Tenth gear was not run as it was over 15 mph. This tractor is equipped with an operator-controlled power-shifting full range fixed-ratio transmission.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 703

L. F. LARSEN

Engineer-in-Charge

L. W. HURLBUT, Chairman

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 transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

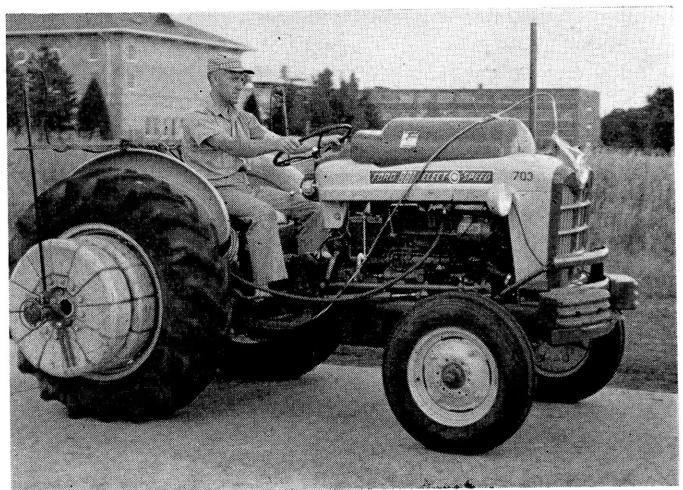
turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum 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.



Ford 881-L (LPG) Test 703