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## Test 1027: Ford 9000 Diesel Dual Power (Also Ford 9000 Diesel Dual Power Row Crop, 8-Speed All Purpose and 8-Speed Row Crop)

Nebraska Tractor Test Lab

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# NEBRASKA TRACTOR TEST 1027 - FORD 9000 DIESEL DUAL POWER

(ALSO FORD 9000 DIESEL DUAL POWER ROW CROP)

ALSO FORD 9000 DIESEL 8-SPEED (ALL PURPOSE)

ALSO FORD 9000 DIESEL 8-SPEED (ROW CROP)

## POWER TAKE-OFF PERFORMANCE

* Hp	Crank- shaft speed rpm	Fuel Consumption		Temperature Degrees F					
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	Barometer inches of Mercury	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours									
131.22	2200	8.039	0.426	16.32	177	54	75	29.227	
Standard Power Take-off Speed (1000 rpm)—One Hour									
126.02	1933	7.343	0.405	17.16	176	52	72	29.210	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
114.43	2257	7.290	0.443	15.70	175	54	75	.....	
0.00	2423	2.459	.....	.....	172	55	76	.....	
59.27	2338	4.801	0.563	12.35	174	55	76	.....	
131.16	2200	8.014	0.425	16.37	174	55	75	.....	
30.32	2393	3.649	0.837	8.31	174	53	73	.....	
87.26	2294	6.030	0.481	14.47	175	54	75	.....	
Av	70.41	2317	5.374	0.531	13.10	174	54	75	29.225

## 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—8th (5PD) Gear											
110.35	8974	4.61	2201	7.91	8.051	0.507	13.71	180	51	60	29.025
75% of Pull at Maximum Power—Ten Hours—8th (5PD) Gear											
92.72	7109	4.89	2289	6.14	7.135	0.535	13.00	176	39	46	29.312
50% of Pull at Maximum Power—Two Hours—8th (5PD) Gear											
64.30	4726	5.10	2342	4.28	5.937	0.642	10.83	179	29	32	29.340
MAXIMUM POWER WITH BALLAST											
106.47	13981	2.86	2242	13.29	5th Gear (3PD)			175	38	45	29.200
109.61	11051	3.72	2199	10.22	6th Gear (3DD)			173	46	53	29.110
113.42	10950	3.88	2204	10.29	7th Gear (4PD)			174	48	57	29.110
115.57	9440	4.59	2203	8.38	8th Gear (5PD)			177	49	56	29.110
110.71	8042	5.16	2200	6.99	9th Gear (4DD)			178	49	59	29.090
113.54	7040	6.05	2200	5.94	10th Gear (5DD)			178	48	58	29.110
117.35	6595	6.67	2201	5.56	11th Gear (6PD)			177	49	59	29.060
112.32	4837	8.71	2204	4.16	12th Gear (6DD)			177	50	62	29.050
115.70	4238	10.24	2202	3.76	13th Gear (7PD)			178	49	59	29.040
106.92	3013	13.31	2204	2.72	14th Gear (7DD)			177	49	58	29.040
110.18	2967	13.93	2213	2.55	15th Gear (8DD)			175	51	60	29.040

## MAXIMUM PULL WITHOUT BALLAST

109.69	9436	4.36	2227	14.82	8th Gear (5PD)		178	46	47		28.910
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## VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST

8th (5PD) Gear						
Pounds Pull	9440	10163	10659	10613	10009	8756
Horsepower	115.57	109.76	102.55	89.34	72.46	53.92
Crankshaft speed rpm	2203	1960	1755	1539	1313	1102
Miles per hour	4.59	4.05	3.61	3.16	2.71	2.31
Slip of drivers, %	8.38	9.17	9.73	9.87	9.17	7.87

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 23.1-34; 8; 16	Two 23.1-34; 8; 16
	—Liquid	1,835 lb each	None
	Cast iron	1,300 lb each	None
Front tires	—No, size, ply & psi	Two 11.00-16; 6; 28	Two 11.00-16; 6; 28
	—Liquid	None	None
	Cast iron	60 lb each	None
Height of drawbar		19.5 inches	22 inches
Static weight with operator—	Rear	14,180 lb	7,910 lb
	Front	3,820 lb	3,700 lb
	Total	18,000 lb	11,610 lb

Department of Agricultural Engineering

Dates of Test: October 21 to October 30, 1969

Manufacturer: FORD MOTOR COMPANY, FORD TRACTOR OPERATIONS, BIRMINGHAM, MICHIGAN

**FUEL, OIL and TIME** Fuel No 2 diesel Cetane No 52.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8353 Weight per gallon 6.955 lb Oil SAE 20-20W API service classification MS-DS To motor 3.202 gal Drained from motor 2.353 gal Transmission and final-drive lubricant Ford oil M-2C53-B or ESN-M2C53-A Total time engine was operated 45½ hours.

**ENGINE** Make Ford Diesel Type 6 cylinder vertical with turbo-charger Serial No H127347 Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 4.4" x 4.4" Compression ratio 16.5 to 1 Displacement 401 cu in Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable paper element and automatic dust unloader Oil filter dual media full flow with replaceable element Oil cooler engine cooler heat exchanger for engine oil and radiator for transmission and hydraulic oil Fuel filter screen in tank, dual replaceable paper elements with water traps Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No H1018M C248787 Tread width rear 68" to 90" front 56" to 84" Wheel base 91.5 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 28.4" Vertical distance above roadway 38" Horizontal distance from center of rear wheel tread 0" to the right/left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range operator controlled power shifting Advertised speeds mph first 1.48 second 1.90 third 2.09 fourth 2.69 fifth 3.14 sixth 4.04 seventh 4.21 eighth 4.87 ninth 5.41 tenth 6.27 eleventh 6.89 twelfth 8.86 thirteenth 10.35 fourteenth 13.31 fifteenth 13.85 sixteenth 17.81 reverse 1.84, 2.37, 6.07 and 7.80 Clutch single plate dry disc operated by foot pedal Brakes wet disc hydraulically actuated by two foot pedals which can be locked together Steering hydrostatic Turning radius (on concrete surface with brake applied) right 132" left 132" (on concrete surface without brake) right 156" left 156" Turning space diameter (on concrete surface with brake applied) right 287" left 287" (on concrete surface without brake) right 322" left 322" Power take-off 1000 rpm at 1935 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, second, third and fourth gears were not run as it was necessary to limit the pull in fifth gear because of the stability formula. Sixteenth gear was not run as it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1027.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

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,  $\frac{1}{2}$  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.



FORD 9000 DIESEL DUAL POWER