PAMI

OECD NO. 1615 Restricted Code
Date of Approval: May 20, 1996

REPORT OF TEST IN ACCORDANCE WITH **OECD RESTRICTED CODE (CODE II)**
FOR THE OFFICIAL TESTING OF AGRICULTURAL TRACTORS



CATERPILLAR/CHALLENGER/35
RUBBER TRACKED TRACTOR

Manufactured by: **Caterpillar Inc.**
100 N.E. Adams Street
Peoria, Illinois
61629 USA

Date of Test: October, 1995

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

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Manufacturer's Name and Address:	Caterpillar Inc. 100 N.E. Adams Street Peoria, Illinois 61629 USA
Location of tractor assembly plant:	Winnipeg, MB; Canada
Submitted for test by:	Manufacturer
Selected for test by:	Manufacturer, with agreement of the test station
Place of running in:	Caterpillar Proving Grounds Peoria, Illinois
Duration of running in:	105 h
Location of test:	PTO and hydraulic power and lift tests carried out at: Prairie Agricultural Machinery Institute (PAMI) Portage la Prairie, MB; Canada Drawbar performance and noise tests carried out at the manufacturer's premises VERSATILE FARM EQUIPMENT Test Track Sanford, Manitoba and witnessed by D.J. May, P.Eng., Project Engineer and K.A. Carmichael, Project Technologist, (PAMI - Portage la Prairie).

1. SPECIFICATIONS OF TRACTOR

1.1 IDENTIFICATION

Make/Model/Type:	Caterpillar/Challenger/C35
Number of driving members:	2 tracks (rubber belts)
Serial Nº:	8DN00333
1st Serial Nº:	Confidential

1.2 ENGINE

Make/Model/Type:	Caterpillar/3116/DITATAC/Diesel direct injection turbo air to air after cooled
Serial Nº:	98Z11221

1.2.1 Cylinders

Number/disposition:	6/in-line, vertical
Bore/Stroke:	105 mm / 127 mm (4.13 in/5.00 in)
Capacity:	6598 cm^3 (401.9 in^3)

Compression ratio:	16.7:1
Arrangement of valves:	Two valve overhead
Cylinder liners:	Dry, (parent bore)

1.2.2 Supercharging

Make/Model:	Schwitzer/S2ES70UU1 76/27AL-DDM .70VTF/exhaust gas driven
Pressure:	142 to 192.9 kPa (20.6 to 27.8 psi) at rated engine speed and load

1.2.3 Fuel System

Fuel feed system:	Engine driven transfer pump/Piston type/Integral w/114-4523 governor
Make/model/type of fuel filters:	Primary: Caterpillar/117-4089/150 micron sock type element Secondary: Caterpillar/1R0753/2 micron paper media spin-on
Capacity of fuel tank:	473 L (125 US gal)
Fuel Cooler:	Heat Exchanger with air for inlet fuel
Make/model/type of injection pump:	Caterpillar/114-4523/Transfer Pump integral with governor
Serial Nº:	00230730 - D
Manufacturer's production rack setting:	8.00
Flow rate (rated engine speed and full load):	35.4± 1.77 kg/h (78.0 ± 3.90 lb/h)
Fuel density:	0.839 g/cm^3 (7.002 lb/US gal)
Make/model/type of injectors:	Caterpillar/107-7735/Mechanical unit injectors
Injection pressure:	41 to 127 MPa (5950 to 18420 psi)
Timing:	10° BTDC

1.2.4 Governor

Make/model/type:	Caterpillar/114-8706/Hydro-mechanical
Governed range of speed:	from 900 to 2300 rev/min
Rated engine speed:	2100 rev/min
High idle speed range:	2300 ± 50 rpm

1.2.5 Air cleaner

Pre-cleaner:	Aspirator
Make/model/type:	Donaldson/SRB120369/Venturi
Location of air intake:	In front of radiator under hood

Main Cleaner:	
Make/model/type:	Primary: Donaldson/6I2501/Radial seal paper element Secondary: Donaldson/6I2502/Radial seal paper element
Maintenance indicator:	Gauge on outlet of air cleaner, indicator light in cab

1.2.6 Lubrication system

Type of feed pump:	Engine Driven
Type of filter:	Caterpillar/1R0739/Paper element spin-on
Number:	One

1.2.7 Cooling system

Type of coolant:	thylene or Propylene Glycol 50/50 mixture
Type of pump:	Belt driven centrifugal pump
Specification of fan:	129-5450
Number of fan blades:	8
Fan diameter:	760 mm (30 in)
Coolant capacity:	32.6 L (8.6 US gal)
Type of temperature control:	Thermostat

1.2.8 Starting system

Make/model/type:	Delco /37 MT/Type 300 solenoid engagement
Starter motor power rating:	5.0 kW (6.7 hp)
Cold starting aid:	inlet heater, 12 V, 109-3000 Jacket water heater, 120 V, 124-0686
Safety device:	Timer

1.2. 9 Electrical system

Voltage:	12 volt, negative ground
Alternator:	
Make/model/type:	Delco Remy/2151/Type 200, 12 V, negative ground
Power:	115 amp at 2100 engine rpm
Battery (number of accumulators):	Two
Rating:	950 CCA/battery 100 ampere hours per battery at 20 hour rating

1.2.10 Exhaust system

Make/model/type:	Donaldson/129-4048/Expansion
Location:	Vertical on right

1.3 TRANSMISSION TO WHEELS

1.3.1 Clutch (travel alone)

Make/Model/Type:	Funk 9300 Series/Wet multi-plate clutch/Integral with transmission/Oil cooled
Number of plates:	14
Diameter of plates:	150 mm (5.9 in)
Method of operation:	Electronic/Hydraulic/Pedal actuated

1.3.2 Gear box

Make/Model/Type:	Funk 9300 Series, direct drive, full power shift, 9 rotating countershaft controlled by a single lever, oil cooled
Arrangement:	Gear box with full power shift, one lever
Number of gears:	16 forward, 9 reverse
Available options:	Creeper gears optional
Oil Cooler:	Heat exchanger with air

1.3.3 Rear axle and final drives

Make/Model/Type:	CAT/Inboard planetary with 3 planetary Caterpillar differential
Differential lock:	Not Applicable

1.3.4 Front axle and final drives: Not Applicable

1.3.5 Differential lock: Not Applicable

1.3.6 Total Ratios and travelling speeds

Gear No.	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed(*) at rated engine speed of 2100 rev/min km/h	(mph)
Forward			
1	221.0	2.69	(1.67)
2	187.2	3.17	(1.97)
3	160.0	3.70	(2.30)
4	139.6	4.25	(2.64)
5	118.2	5.03	(3.13)
6	101.0	5.87	(3.65)
7	85.8	6.92	(4.30)
8	72.6	8.18	(5.08)
9	62.0	9.56	(5.94)
10	53.1	11.19	(6.95)
11	46.3	12.81	(7.96)
12	39.2	15.13	(9.40)
13	33.5	17.71	(11.00)
14	28.5	20.84	(12.95)
15	24.1	24.64	(15.31)
16	20.6	28.84	(17.92)
Reverse			
3	160.0	3.70	(2.30)
4	139.6	4.25	(2.64)
5	118.2	5.03	(3.13)
6	101.0	5.87	(3.65)
7	85.8	6.92	(4.30)
8	72.6	8.18	(5.08)
9	62.0	9.56	(5.94)
10	53.1	11.19	(6.95)
11	46.3	12.81	(7.96)

* Rolling radius is 749 mm (29.5 in) for travel speed only

1.4 POWER TAKE-OFF

1.4.1 Main power take-off

Type:	Independent
Method of engagement:	Wet clutch/Electronic/Hydraulic
Number of shafts:	One
Method of changing power take-off shaft ends and speeds:	None

1.4.1.1 Power take-off proportional to engine speed at 1000 rev/min

Location:	Rear of tractor
Diameter of power take-off shaft end:	44.95 mm (1.77 in)
Number of splines in conformity with ISO 500/1991:	20 tooth

Height above ground:	750 mm (29.5 in) to CL of shaft
Distance from the median plane of the tractor:	Centre 0 mm (0 in)
Distance behind rear-wheel axis:	600 mm (23.6 in) to end of shaft
PTO speed at rated engine speed (2100 rev/min):	1105 rpm
Engine speed at standard power take-off speed:	1900 rpm
Ratio of rotation speeds (engine speed/PTO speed):	1.9:1
Direction of rotation (viewed from behind tractor):	Clockwise from rear

1.4.1.2 Power take-off proportional to ground speed: None

1.4.2 Optional power take-off None

1.5 POWER LIFT

Make/Model/Type:	CAT 2,3 and 3N with draft and position control with CAT III quick coupler
Type of hydraulic system:	Closed centre, pressure sensing CCLS, load sensing
Number/Type/Size of cylinders (single- or double-acting):	Two, single acting/102 mm (4.0 in), length 200 mm (7.88 in)
Type of linkage lock for transport:	Electro-hydraulic
Relief valve pressure setting (tolerance):	18.96$\pm$ .34 MPa (2750 $\pm$ 50 psi)
Opening pressure of cylinder safety valve (if fitted):	None
Lift pump type:	Variable displacement axial piston pump
Transmission between pump and engine:	Gear drive from engine output to hydraulic pump
Type and number of filters:	Paper filters, three
Site of oil reservoir:	Rear case
Type, number and location of tapping points:	Leverless, quick disconnect, four located at rear of tractor
Maximum volume of oil available to external cylinders:	37 dm^3 (9.8US gal)

1.6 THREE-POINT LINKAGE

Category:	3, in conformity with category 3 of ISO 730/3-1982

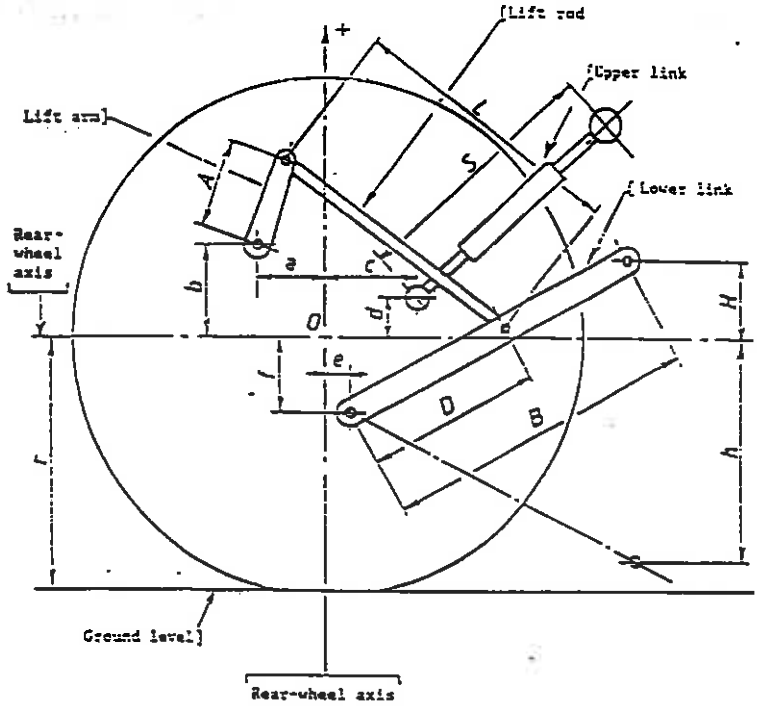


Figure 2.1 Lift test - Linkage geometry

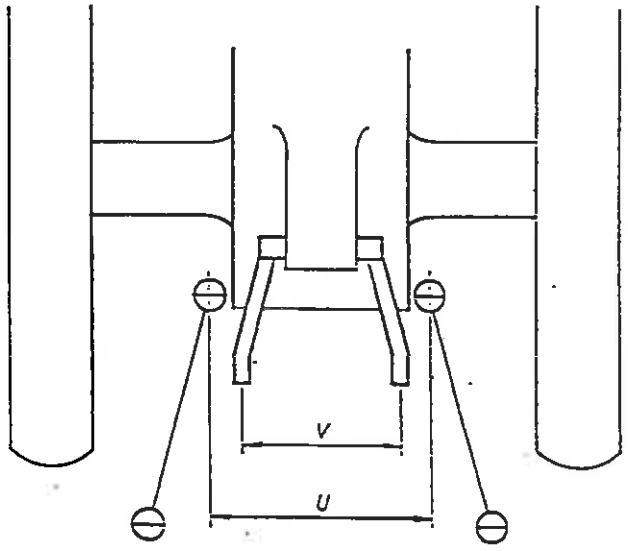


Figure 2.2 Lift test - Linkage geometry

Table 2.1 - Linkage geometry dimensions (when connected to standard frame)

		Dimension or Range mm (in)	Settings used in test mm (in)
Length of lift arms	(A)	380 (15.0)	Same
Length of Lower links	(B)	915 (36.0)	Same
Distance of lift arm pivot point from rear wheel axis: horizontally	(a)	-200 (-7.9)	Same
vertically	(b)	+395 (15.6)	Same
Horizontal distance between the 2 lower link points	(u)	538 (21.2)	Same
Horizontal distance between the 2 lift arm end points	(v)	637 (25.1)	Same
Length of upper link	(s)	605 to 815 (23.8 to 32.1)	766 (30.2)
Distance of upper link pivot point from rear wheel axis: horizontally	(c)	505 (19.9)	Same
vertically	(d)	200 (7.9)	Same
Distance of lower link pivot point from rear wheel axis: horizontally	(e)	325 (12.8)	Same
vertically	(f)	315 (12.4)	Same
Distance of lower link pivot points to lift rod pivot points on lower links	(D)	473 (18.6)	Same
Length of lift rods	(L)	760 to 905 (29.9 to 35.6)	855 (33.7)
Height of lower hitch points relative to the rear-wheel axis: in low position	(h)	436 to 715 (17.2 to 28.1)	609 (24.0)
in high position	(H)	85 to 299 (3.3 to 11.8)	152 (6.0)
Height above ground of lower hitch points when locked in transport position (*)		885 to 1099 (34.8 to 43.3)	952 (37.5)

*r =	810 mm (31.9 in)	Rear wheel centre line height Rolling radius is not the same as centre line wheel height

1.7 SWINGING DRAWBAR

Type:	Sliding drawbar
Height above ground:	
Maximum:	545 mm (21.5 in)
Minimum:	448 mm (17.6 in)
Type of adjustment:	Reverse bend
Distance of hitch point from rear wheel axis, horizontally:	1102 mm (43.4 in)
Distance of hitch point from take-off shaft end:	
Vertical:	305 mm (12.0 in)
Horizontal:	508 mm (20.0 in)
Lateral adjustment (centre of clevis):	
Right-hand:	220 mm (8.7 in) standard cage
Left-hand:	220 mm (8.7 in) standard cage
Distance of pivot point from rear wheel axis, horizontally:	Forward 51 mm (2.0 in)
Diameter of drawbar pin hole:	41 mm (1.6 in)
Maximum vertical permissible load:	20.9 kN (4700 lb)

1.8 HOLED DRAWBAR

Number of holes:	Three
Distance between holes:	102 mm (4.0 in)
Hole diameter:	41 mm (1.6 in)
Thickness/width of the drawbar:	45/76.2 mm (1.8 /3.0 in)
Height above ground:	
Minimum:	448 mm (17.6 in)
Maximum:	545 mm (21.5 in)
Horizontal distance to power take-off shaft end (rear):	508 mm (20.0 in)

1.9 STEERING

Make/Model/Type:	Caterpillar Differential Steering/Sundstrand Pump/Linde or Rexroth Motor/Steering wheel actuated
Method of operation:	Variable steering controlling speed difference between tracks
Pump(s):	Variable displacement pumps and fixed displacement motor
Ram(s):	None
Working pressure:	Up to 43.4 MPa (up to 6300 psi)

1.10 BRAKES

1.10.1 Service brake:

Make/Model/Type:	CAT disk brakes/Multiple disk brakes between steering differential and final drives
Method of operation:	Pedal-hydraulic assist/Hydraulic boosted
Trailer Braking Take-off:	None

1.10.2 Parking brake

Type:	Disk brake on drive line
Method of operation:	Mechanical pull type

1.11 WHEELS

None

1.12 PROTECTIVE STRUCTURE

Make/Model/Type:	ROPS/FOPS
Manufacturer's name and address:	Crenlo Rochester, Minn.
Protective device:	
Cab/Frame/Rollguard/Other:	ROPS/FOPS
Tiltable/Not Tiltable:	Not tiltable
OECD approval number:	None (tested according to SAE J1040-Feb,'86; SAE J1040-April '88; ISO 3449; ISO 3471-986

1.13 SEAT

1.13.1 Driver's Seat

Make/Model/Type:	Sears/SA13773.901/Low Profile
Type of suspension:	Air spring with adjustable damper
Type of damping:	Hydraulic
Range of adjustment:	
Rotation:	30° Degrees (25° to right, 5° to left) 6 stops
Longitudinal:	180 mm (7.1 in)
Vertical:	140 mm (5.5 in)
Optional and Passenger Seats:	None

1.14 LIGHTING

	Height of centre above ground mm (in)	Size mm (in)	Distance from out side edge to median plane of tractor mm (in)
Headlights	1575 (62.0)	250 x 100 (9.8 x 3.9)	373 (14.7)
Sidelights	1455 (57.3)	150 x 80 (5.9 x 3.1)	502 (19.8)
Rear top	2922 (115.0)	150 x 80 (5.9 x 3.1)	490 (19.3)
Reflectors	1880 (74.0)	55 x 70 (2.2 x 2.8)	910 (35.8)
Rear fender	1860 (73.2)	150 x 80 (5.9 x 3.1)	600 (23.6)
Front cab	2850 (112.2)	150 x 80 (5.9 x 3.1)	300 (11.8)

2. TEST CONDITIONS

2.1 OVERALL DIMENSIONS (unballasted tractor)

Length mm (in)	Minimum width mm (in)	Maximum width mm (in)	Height to top of protective structure mm (in)	Height to top of exhaust silencer mm (in)
5658 (222.8)	2324 (91.5)	3099 (122.0)	3500 (137.8)	3280 (129.1)

2.2 Ground clearance (unballasted): 370 mm (14.6 in)

Clearance limiting part: Drawbar cage

2.3 TRACTOR MASS (with cab)

	Unballasted		Ballasted*	
	Without Driver kg (lb)	With Driver kg (lb)	Without Driver kg (lb)	With Driver kg (lb)
Total	10,696 (23,584)	10,771 (23,749)	11,452 (25,250)	11,527 (25,416)

* All ballast in the form of cast iron weights added to frame.

BALLAST DETAILS

	Number of Weights	Total Mass kg (lb)
Front	12	600 (1323)
Roller frame	2	112 (247)
Additional test equipment	-	44 (97)

2.4 TRACK SPECIFICATIONS

Track materials	Rubber/with steel cables
Track width and base	635 mm (25 in), 2187 mm (86.1 in)
Dynamic radius (rolling radius)	750 mm (29.5 in)
Track support system	Roller frame with rollers
Treadbars	72 per track
Number per metre	8.97 per metre (8.20 per yard)
Treadbar width	584 mm (23 in)

2.5 TRACK WIDTH SPECIFICATIONS

	Minimum mm (in)	Maximum mm (in)	Adjustment method	Setting used in test mm (in)
Tracks	1524 (60)	2286 (90.0)	Spacers	2235 (88)

2.6 OILS AND LUBRICATION

2.6.1 Capacity and change interval

	Capacity dm^3	Oil Change h	Filter Change h
Engine	330	250	250
Gear box	*Common w/rear axle	-	-
Front axle	-	-	-
Rear axle	1506	1000	50 then 1000
Final drive (front)	-	-	-
Final drive (rear)	*Common w/rear axle	-	-
Hydraulic system	*Common w/rear axle	-	-
Other (steering)	*Common w/rear axle	-	-

* common with gear box or rear axle

2.6.2 Specifications (SAE, API, Mil.L, ISO)

	Recommended	Used during the test
Engine oil . type: . viscosity: . classification:	CATERPILLAR SAE 10W-30 CF-4 (APS)	Same
Transmission oils . type: . viscosity: . classification:	CATERPILLAR SAE 10W-30 CF-4 (MTO)	Same
Hydraulic fluid . type: . viscosity: . classification:	Common with transmission	Same
Steering oil . type: . viscosity: . classification:	Common with transmission	Same

2.6.3 Grease:

Number of lubrication points: 10 grease points all on 3 pt linkage

2.7 FUEL

Type: In conformity with national standard

Density at 15°C (60°F):

For PTO Test: 0.848 g/cm^3 (7.076 lb/US gal)

For Drawbar Test: 0.844 g/cm^3 (7.044 lb/US gal)

3. COMPULSORY TEST RESULTS

3.1 Main power take-off test

Date and location of tests: October 16, 1995
Prairie Agricultural Machinery Institute;
Portage la Prairie, MB; Canada

Type of dynamometer: AW Dynamometer Inc., Water Brake Dynamometer, Model 375

Power	Speed		Fuel Consumption			Specific Energy
	Engine	PTO	Hourly		Specific	
kW	rev/min		kg/h	l/h	g/kWh	kWh/l
3.1.1 MAXIMUM POWER - TWO-HOUR TEST						
150.0	1751	921	34.2	40.3	228	3.72
3.1.2 POWER AT RATED ENGINE SPEED						
131.8	2100	1105	34.4	40.5	261	3.24
3.1.3 STANDARD POWER TAKE-OFF SPEED (1000 ± 25 rev/min)						
146.0	1897	999	35.4	41.7	242	3.50
3.1.4 PART LOADS 3.1.4.1 the torque corresponding to maximum power at rated engine speed						
131.8	2100	1105	34.4	40.5	261	3.24
3.1.4.2 85% of torque obtained in 3.1.4.1						
115.5	2166	1140	31.9	37.6	276	3.08
3.1.4.3 75% of torque defined in 3.1.4.2						
87.9	2200	1158	27.6	32.5	314	2.70
3.1.4.4 50% of torque defined in 3.1.4.2						
59.4	2228	1173	21.8	25.8	368	2.30
3.1.4.5 25% of torque defined in 3.1.4.2						
30.2	2262	1191	16.8	19.8	556	1.53
3.1.4.6 unloaded						
2.2	2289	1205	12.8	15.1	5704	0.15
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 rev/min) 3.1.5.1 the torque corresponding to maximum power						
146.0	1897	999	35.4	41.7	242	3.50
3.1.5.2 85% of torque obtained in 3.1.5.1						
134.6	2057	1082	34.9	41.1	259	3.27
3.1.5.3 75% of torque defined in 3.1.5.2						
105.6	2152	1133	30.8	36.4	292	2.90
3.1.5.4 50% of torque defined in 3.1.5.2						
72.0	2202	1159	24.8	29.2	344	2.46
3.1.5.5 25% of torque defined in 3.1.5.2						
36.7	2240	1179	19.4	22.9	528	1.61
3.1.5.6. unloaded						
0.9	2275	1198	14.5	17.1	15338	0.06

No load maximum engine speed: 2289 rev/min

Torque (equivalent crankshaft) at maximum power:

at rated engine speed	598.9 Nm (440.5 ft-lb)
at standard power take-off speed	723.7 Nm (534.2 ft-lb)
at maximum power	818.1 Nm (603.4 ft-lb)

Power	Speed		Fuel Consumption			Specific Energy
	Engine	PTO	Hourly		Specific	
hp	rev/min		lb/h	US gal/h	lb/hp-h	hp-h/US gal
3.1.1 MAXIMUM POWER - TWO-HOUR TEST						
201.1	1751	921	75.3	10.6	0.374	18.90
3.1.2 POWER AT RATED ENGINE SPEED						
176.6	2100	1105	76.6	10.8	0.434	16.32
3.1.3 STANDARD POWER TAKE-OFF SPEED (1000 ± 25 rev/min)						
195.7	1897	999	78.0	11.0	0.399	17.75
3.1.4 PART LOADS 3.1.4.1 the torque corresponding to maximum power at rated engine speed						
176.6	2100	1105	76.6	10.8	0.434	16.32
3.1.4.2 85% of torque obtained in 3.1.4.1						
154.9	2166	1140	70.2	9.9	0.453	15.61
3.1.4.3 75% of torque defined in 3.1.4.2						
117.8	2200	1158	60.8	8.6	0.516	13.72
3.1.4.4 50% of torque defined in 3.1.4.2						
79.6	2228	1173	48.2	6.8	0.605	11.69
3.1.4.5 25% of torque defined in 3.1.4.2						
40.5	2262	1191	37.0	5.2	0.914	7.75
3.1.4.6 unloaded						
3.0	2289	1205	28.3	4.0	9.380	0.75
3.1.5 PART LOADS AT STANDARD POWER TAKE-OFF SPEED (1000 rev/min) 3.1.5.1 the torque corresponding to maximum power						
195.7	1897	999	78.0	11.0	0.399	17.75
3.1.5.2 85% of torque obtained in 3.1.5.1						
180.4	2057	1082	76.9	10.9	0.426	16.60
3.1.5.3 75% of torque defined in 3.1.5.2						
141.5	2152	1133	68.0	9.6	0.480	14.74
3.1.5.4 50% of torque defined in 3.1.5.2						
96.5	2202	1159	54.6	7.7	0.566	12.50
3.1.5.5 25% of torque defined in 3.1.5.2						
49.3	2240	1179	42.8	6.1	0.869	8.15
3.1.5.6 unloaded						
1.3	2275	1198	31.9	4.5	25.224	0.28

Maximum torque (equivalent crankshaft): 1010.7 Nm (745.3 ft-lb) at 1201 rev/min

Mean atmospheric conditions:

Temperature: 25°C (77°F)

Pressure: 101.49 kPa (30.05 in-Hg)

Relative Humidity: 79%

Maximum temperatures:

Coolant: 86°C (187°F)

Engine oil: 100°C (212°F)

Fuel: 35°C (95°)

Engine air intake: 34°C (93°F)

3.2 HYDRAULIC POWER AND LIFTING FORCE

Date of tests: October 28 - November 9 , 1995
Prairie Agricultural Machinery Institute
Portage la Prairie, Manitoba; Canada

3.2.1 HYDRAULIC POWER TEST

Sustained pressure with relief valve open: 18.8 MPa (2727 psi)
Tapping point used for test: One remote hydraulic outlet
Pump delivery rate at minimum pressure (high idle) 98.4 l/min (26.0 gal/min)

	Flow Rate l/min (US gal/min)	Pressure MPa (psi)	Power kW (hp)
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	56.4 (14.9)	16.9 (2455)	15.6 (20.9)
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	82.1 (21.7)	14.0 (2029)	19.1 (25.7)

Tapping point used for test: Two, remote hydraulic outlets
Pump delivery rate at minimum pressure (rated engine speed): 124.5 l/min (32.9 gal/min)

	Flow Rate l/min (US gal/min)	Pressure MPa (psi)	Power kW (hp)
Flow rate corresponding to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting and corresponding hydraulic power	57.2 (15.1)	16.9 (2455)	15.9 (21.3)
Flow rate and hydraulic pressure corresponding to maximum hydraulic power	123.4 (32.6)	13.3 (1927)	27.3 (36.6)

Temperature of hydraulic fluid: 65 $\pm$ 5°C (148 $\pm$ 9°F)
Opening and closing pressure of the unloading valve: Not applicable since the system does not use an accumulator

3.2.2 POWER LIFT TEST

Linkage settings for test - See Table 2.1 and Figures 2.1 and 2.2

	at the hitch point	on the frame
Height of lower hitch points above ground in down position	202 mm (8.0 in)	195 mm (7.7 in)
Vertical movement:		
unloaded	756 mm (29.8 in)	962 mm (37.9 in)
loaded	688 mm (27.1 in)	838 mm (33.0 in)
Maximum corrected force exerted through full range	57.1 kN (12840 lb)	50.3 kN (11300 lb)
Corresponding pressure of hydraulic fluid	16.9 MPa (2455 psi)	16.9 MPa (2455 psi)
Moment about rear-wheel axis	68.6 kNm (50500 ft-lb)	115.6 kNm (85320 ft-lb)
Maximum tilt angle of mast from vertical		12 degrees

Lifting heights relative to the horizontal plane including the lower link pivot points												
mm	-300 (-11.8)	-293 (-11.5)	211 (-11.5)	-200 (-7.9)	-100 (-3.9)	0 (0)	+100 (3.9)	+200 (7.9)	+300 (11.8)	+395 (15.6)	+400 (15.7)	+404 (15.9)
Lifting forces (the values of force measured shall be corrected to correspond to a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system).												
at the hitch points in kN (lb)	–	57.1 (12840)	–	60.9 (13700)	64.4 (14470)	67.2 (15110)	69.4 (15610)	71.0 (15970)	72.0 (10190)	72.4 (16270)	–	–
Corresponding pressure					16.9 MPa (2455 psi)							
at the frame in kN (lb)	50.9 (11440)	–	50.3 (11300)	52.4 (11780)	53.9 (12130)	55.2 (12420)	56.1 (12610)	56.3 (12650)	55.6 (12500)	–	53.8 (12100)	53.7 (12080)
Corresponding pressure:					16.9 MPa (2455 psi)							

3.3 DRAWBAR PERFORMANCE

Date of tests: October 26,1995

Versatile Farm Equipment Operations Test Track
Sanford, Manitoba; Canada

Type of track: Concrete

Height of drawbar above ground
- unballasted: 448 mm (17.6 in)
- ballasted: 450 mm (17.7 in)

Gear and Range	Power	Drawbar pull			Slip of tracks	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine Oil	Temperature	Relative Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kWh/l	°C	°C	°C	°C	%	kPa
3.3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
F1	74.01	111.34	2.39	2205	15.0	380	2.22	15	82	87	0	94	100.25
F2	86.88	111.51	2.80	2188	14.9	358	2.36	15	82	88	0	94	100.25
F3	99.43	111.69	3.20	2138	15.0	348	2.42	15	82	88	0	94	100.25
F4	107.48	111.87	3.46	2017	15.0	326	2.59	15	82	89	0	94	100.25
F5	116.17	111.69	3.75	1842	15.0	305	2.77	15	82	89	0	94	100.25
F6	126.50	101.25	4.50	1752	8.1	279	3.03	15	82	89	0	94	100.25
F7	132.77	86.98	5.50	1750	4.5	266	3.17	14	83	91	0	94	100.25
F8	135.58	74.66	6.54	1752	4.1	261	3.23	14	82	89	0	91	100.19
F9	136.70	63.09	7.80	1751	2.0	258	3.27	14	82	90	0	91	100.19
F10	132.88	52.08	9.19	1752	1.4	266	3.17	14	83	91	0	91	100.19
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
F9	116.86	44.59	9.44	2101	1.2	295	2.86	14	82	89	0	91	100.19
3.3.2.1.1 75% of pull at maximum power at rated speed													
F9	91.72	33.50	9.86	2188	1.0	331	2.55	14	82	90	0	92	100.09
3.3.2.1.2 50% of pull at maximum power at rated speed													
F9	62.26	22.35	10.03	2219	0.7	403	2.09	14	83	90	0	92	100.09
3.3.2.1.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
F10	91.97	33.45	9.90	1877	0.8	303	2.79	15	83	89	0	92	100.09
3.3.2.1.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
F10	62.05	22.40	9.97	1886	0.6	352	2.40	15	82	88	0	92	100.09
3.3.2.2 in selected gear nearest to 7.5 km/h at rated speed													
F8	118.23	53.49	7.96	2100	2.6	293	2.88	14	83	90	0	91	100.19
3.3.2.2.1 75% of pull at maximum power at rated speed													
F8	92.95	40.14	8.34	2189	2.1	326	2.59	14	82	90	0	91	100.19
3.3.2.2.2 50% of pull at maximum power at rated speed													
F8	63.07	26.76	8.49	2223	1.8	384	2.20	14	82	89	0	91	100.19
3.3.2.2.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
F9	93.49	40.33	8.35	1855	1.1	284	2.97	15	83	89	0	92	100.09
3.3.2.2.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
F9	62.99	26.77	8.47	1877	0.8	339	2.49	15	82	88	0	92	100.09

Gear and Range	Power	Drawbar pull			Slip of tracks	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine Oil	Temperature	Relative Humidity	Pressure
	hp	lb	mph	rev/min	%	lb/hp-h	hp-h/gal	°F	°F	°F	°F	%	in Hg
3.3.1 MAXIMUM POWER IN TESTED GEARS (unballasted tractor)													
F1	99.21	25030	1.49	2205	15.0	0.625	11.27	59	180	189	32	94	29.7
F2	116.46	25070	1.74	2188	14.9	0.588	11.97	59	180	190	32	94	29.7
F3	133.28	25110	1.99	2138	15.0	0.572	12.30	59	180	190	32	94	29.7
F4	144.08	25150	2.15	2017	15.0	0.536	13.15	59	180	192	32	94	29.7
F5	155.73	25110	2.33	1842	15.0	0.501	14.05	59	180	192	32	94	29.7
F6	169.58	22760	2.80	1752	8.1	0.458	15.36	59	180	192	32	94	29.7
F7	177.98	19550	3.41	1750	4.5	0.437	16.10	57	181	196	32	94	29.7
F8	181.75	16790	4.06	1752	4.1	0.430	16.39	57	180	192	32	91	29.7
F9	183.24	14180	4.85	1751	2.0	0.425	16.57	57	180	194	32	91	29.7
F10	178.13	11710	5.71	1752	1.4	0.437	16.10	57	181	196	32	91	29.7
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
F9	156.65	10020	5.86	2101	1.2	0.486	14.50	57	180	192	32	91	29.7
3.3.2.1.1 75% of pull at maximum power at rated speed													
F9	122.95	7530	6.12	2188	1.0	0.544	12.95	57	180	194	32	92	29.6
3.3.2.1.2 50% of pull at maximum power at rated speed													
F9	83.46	5030	6.23	2219	0.7	0.663	10.62	57	181	194	32	92	29.6
3.3.2.1.3 next higher gear at reduced engine speed: same pull and travelling speed as in 3.3.2.1.1													
F10	123.28	7520	6.15	1877	0.8	0.498	14.14	59	181	192	32	92	29.6
3.3.2.1.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
F10	83.18	5040	6.20	1886	0.6	0.579	12.16	59	180	190	32	92	29.6
3.3.2.2 in selected gear nearest to 7.5 km/h at rated speed													
F8	158.49	12030	4.94	2100	2.6	0.482	14.62	57	181	194	32	91	29.7
3.3.2.2.1 75% of pull at maximum power at rated speed													
F8	124.60	9020	5.18	2189	2.1	0.535	13.15	57	180	194	32	91	29.7
3.3.2.2.2 50% of pull at maximum power at rated speed													
F8	84.55	6020	5.27	2222	1.8	0.632	11.14	57	180	192	32	91	29.7
3.3.2.2.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
F9	125.32	9070	5.19	1855	1.1	0.468	15.06	59	181	192	32	92	29.6
3.3.2.2.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
F9	84.43	6020	5.26	1877	0.8	0.557	12.64	59	180	190	32	92	29.6

4. OPTIONAL TESTS

4.1 BALLASTED DRAWBAR TEST

Date and Location of Test: October 25, 1995
Versatile Farm Equipment Test Track
Sanford, Manitoba; CANADA

Type of Track: Concrete

Gear and Range	Power	Drawbar pull	Ground speed	Engine speed	Slip of tracks	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine Oil	Temperature	Relative Humidity	Pressure
	kW	kN	km/h	rev/min	%	g/kWh	kW-h/l	°C	°C	°C	°C	%	kPa
3.3.1 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
F1	80.97	122.50	2.38	2193	15.0	363	2.32	19	83	89	0	93	100.04
F2	94.64	122.42	2.78	2172	15.0	348	2.43	19	83	89	0	93	100.04
F3	104.58	121.17	3.11	2073	15.0	333	2.54	20	83	90	0	93	100.04
F4	110.78	118.89	3.35	1958	15.0	315	2.68	21	83	90	0	91	99.99
F5	124.38	118.14	3.79	1751	9.6	281	3.01	21	84	91	0	91	99.99
F6	129.45	100.52	4.64	1749	5.2	270	3.12	21	84	92	0	91	99.99
F7	133.13	85.89	5.58	1751	3.1	262	3.22	21	84	92	0	91	99.99
F8	136.18	74.34	6.59	1752	2.9	258	3.27	19	83	88	0	91	99.99
F9	135.60	62.37	7.83	1750	1.7	257	3.28	19	84	91	0	91	99.99
F10	131.44	51.52	9.19	1750	1.3	265	3.19	19	84	91	0	91	99.99
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
F8	118.41	53.53	7.96	2098	2.1	290	2.91	20	84	91	0	91	99.99
3.3.2.1.1 75% of pull at maximum power at rated speed													
F8	93.09	40.17	8.34	2189	1.7	321	2.63	20	83	90	0	91	99.99
3.3.2.1.2 50% of pull at maximum power at rated speed													
F8	63.09	26.75	8.49	2220	1.4	384	2.20	20	83	90	0	91	99.99
3.3.2.1.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
F9	93.70	40.29	8.37	1859	1.0	287	2.94	20	83	89	2	90	99.92
3.3.2.1.4 next higher gear at reduced engine speed: same pull and travelling speed as in 3.3.2.1.2													
F9	63.12	26.79	8.48	1877	0.7	338	2.50	20	82	88	2	90	99.92
3.3.2.2 in selected gear nearest to 7.5 km/h at rated speed													
F9	116.96	44.52	9.46	2103	1.1	299	2.83	20	84	90	2	90	99.92
3.3.2.2.1 75% of pull at maximum power at rated speed													
F9	91.40	33.36	9.86	2187	0.9	330	2.55	20	83	90	2	90	99.92
3.3.2.2.2 50% of pull at maximum power at rated speed													
F9	62.17	22.30	10.04	2219	0.5	401	2.10	20	83	90	2	90	99.92
3.3.2.2.3 next higher gear at reduced engine speed: same pull and travelling speed as in 3.3.2.2.1													
F10	91.27	33.33	9.86	1868	0.7	302	2.79	20	82	89	2	90	99.92
3.3.2.2.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
F10	61.30	22.18	9.95	1880	0.5	354	2.39	20	82	89	2	90	99.92

Gear and Range	Power	Drawbar pull	Ground speed	Engine speed	Slip of tracks	Specific fuel consumption	Specific Energy	Temperature			Atmospheric conditions		
								Fuel	Coolant	Engine Oil	Temperature	Rel. Hum.	Pressure
	hp	lb	mph	rev/min	•%	lb/hp-h	hp-h/gal	•F	•F	•F	•F	%	in Hg
3.3.1 MAXIMUM POWER IN TESTED GEARS (ballasted tractor)													
F1	108.53	27540	1.48	2193	15.0	0.557	11.80	66	181	192	32	93	29.6
F2	126.86	27520	1.73	2172	15.0	0.572	12.31	66	181	192	32	93	29.6
F3	140.18	27240	1.93	2073	15.0	0.547	12.87	68	181	194	32	93	29.6
F4	148.50	26730	2.08	1958	15.0	0.518	13.59	70	181	194	32	91	29.6
F5	166.73	26560	2.36	1751	9.6	0.461	15.26	70	183	196	32	91	29.6
F6	173.52	22600	2.88	1749	5.2	0.444	15.85	70	183	198	32	91	29.6
F7	178.46	19310	3.47	1751	3.1	0.431	16.33	70	183	198	32	91	29.6
F8	182.55	16710	4.10	1752	2.9	0.425	16.58	66	181	190	32	91	29.6
F9	181.78	14020	4.86	1750	1.7	0.423	16.64	66	183	196	32	91	29.6
F10	176.19	11580	5.71	1750	1.3	0.436	16.16	66	183	196	32	91	29.6
3.3.2 FUEL CONSUMPTION													
3.3.2.1 in selected gear, at maximum power at rated speed													
F8	158.73	12040	4.95	2098	2.1	0.476	14.79	68	183	196	32	91	29.6
3.3.2.1.1 75% of pull at maximum power at rated speed													
F8	124.79	9030	5.18	2189	1.7	0.527	13.35	68	181	194	32	91	29.6
3.3.2.1.2 50% of pull at maximum power at rated speed													
F8	84.56	6010	5.27	2220	1.4	0.632	11.15	68	181	194	32	91	29.6
3.3.2.1.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.1													
F9	125.60	9060	5.20	1859	1.0	0.472	14.93	68	181	192	36	90	29.6
3.3.2.1.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.1.2													
F9	84.61	6020	5.27	1877	0.7	0.556	12.66	68	180	190	36	90	29.6
3.3.2.2 in selected gear nearest to 7.5 km/h at rated speed													
F9	156.78	10010	5.88	2103	1.1	0.491	14.34	68	183	194	36	90	29.6
3.3.2.2.1 75% of pull at maximum power at rated speed													
F9	122.52	7500	6.13	2187	0.9	0.543	12.96	68	181	196	36	90	29.6
3.3.2.2.2 50% of pull at maximum power at rated speed													
F9	83.34	5010	6.24	2219	0.5	0.659	10.68	68	181	194	36	90	29.6
3.3.2.2.3 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.1													
F10	122.35	7490	6.13	1868	0.7	0.497	14.17	68	181	192	36	90	29.6
3.3.2.2.4 next higher gear at reduced engine speed; same pull and travelling speed as in 3.3.2.2.2													
F10	82.17	4990	6.18	1880	0.5	0.582	12.10	68	180	190	36	90	29.6

4.2 POWER LIFT TEST (according to ASAE S349.2 July 1991 Static Test)

	on the frame
Height of lower hitch points above ground in down position	215 mm (8.5 in)
Vertical movement without load	932 mm (36.7 in)
Vertical movement with load	837 mm (33.0 in)
Maximum corrected force exerted through full range	59.9 kN (13470 lb)
Corresponding pressure of hydraulic fluid	18.6 MPa (2700 psi)
Moment about rear-wheel axis	98.8 kNm (72920 ft)
Maximum tilt angle of mast from vertical	11 degrees

The lower links were adjusted during the test to meet the specified power range.

Lifting heights relative to the horizontal plane including the lower link pivot points											
mm (in)	-	-280 (11.0)	-200 (7.9)	-100 (3.9)	0	+100 (3.9)	+200 (7.9)	+300 (11.8)	+400 (15.7)	+500 (19.7)	+557 (21.9)
Lifting forces (the values of force measured shall be corrected to correspond to the minimum system (a hydraulic pressure equivalent to 90% of the actual relief valve pressure setting of the hydraulic lift system)											
at the frame in kN	-	64.3 (14460)	66.7 (14990)	68.8 (15480)	70.0 (15750)	70.3 (15820)	69.7 (15670)	68.2 (15320)	65.7 (14770)	62.3 (14000)	59.9 (13470)
Corresponding pressrue:					18.6 MPa 2700 psi						

4.3 NOISE TESTS

Date of tests:	October 25, 1995
Location of tests:	Versatile Farm Equipment Test Track Sanford, Manitoba; Canada
Sound level meter Make/Model/Type:	Bruel & Kjaer/Model T2236/Precision Integrating Sound Level Meter
Type of track:	Concrete
External Noise Level Gear Number:	F16
Travelling speed before acceleration:	2164 km/h (13.4 mph)
Sound level:	88.6 dB(A)
Noise at operator ear 75% pull at maximum power rated speed noise level	75.1 dB(A)
Gear Number:	F9

5. REPAIRS

None

6. REMARKS

None

7. ANNEX (CURVES)

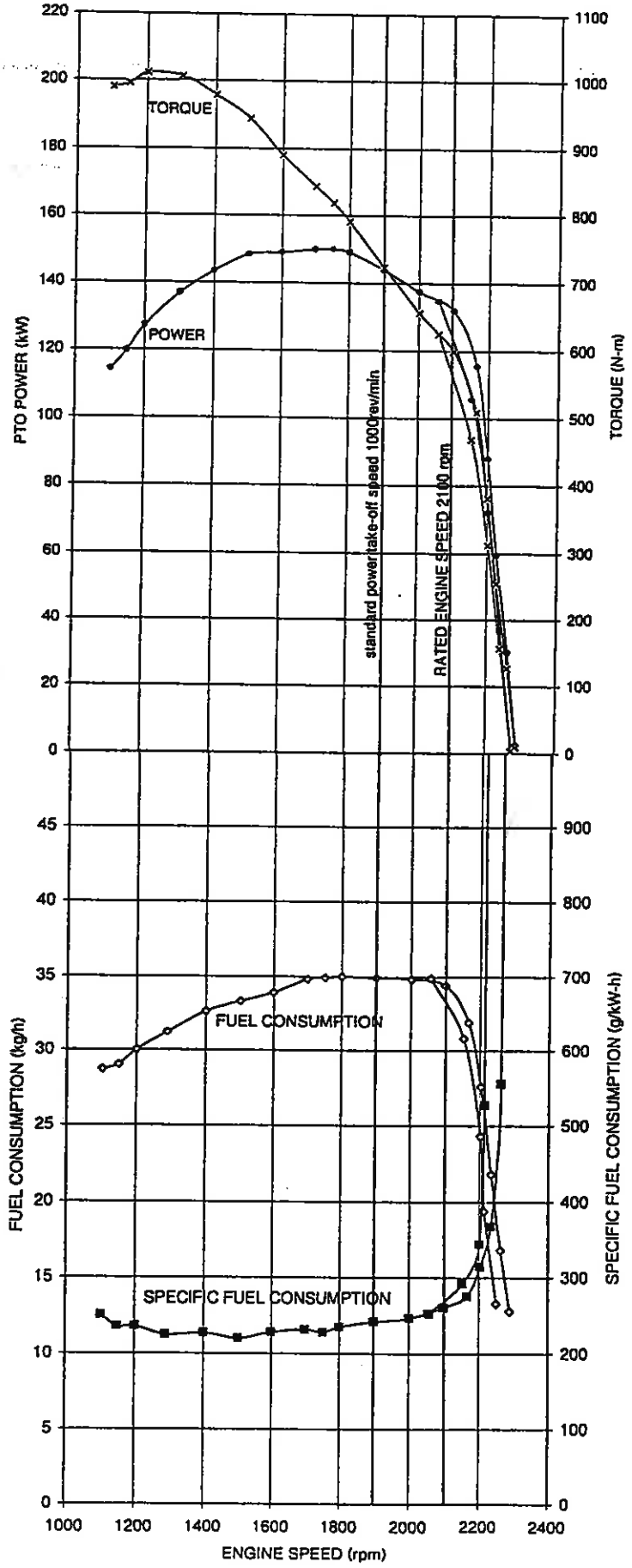
Tests carried out by: D.J. May, P.Eng., Project Engineer
K.A. Carmichael, Project Technologist

Signed:

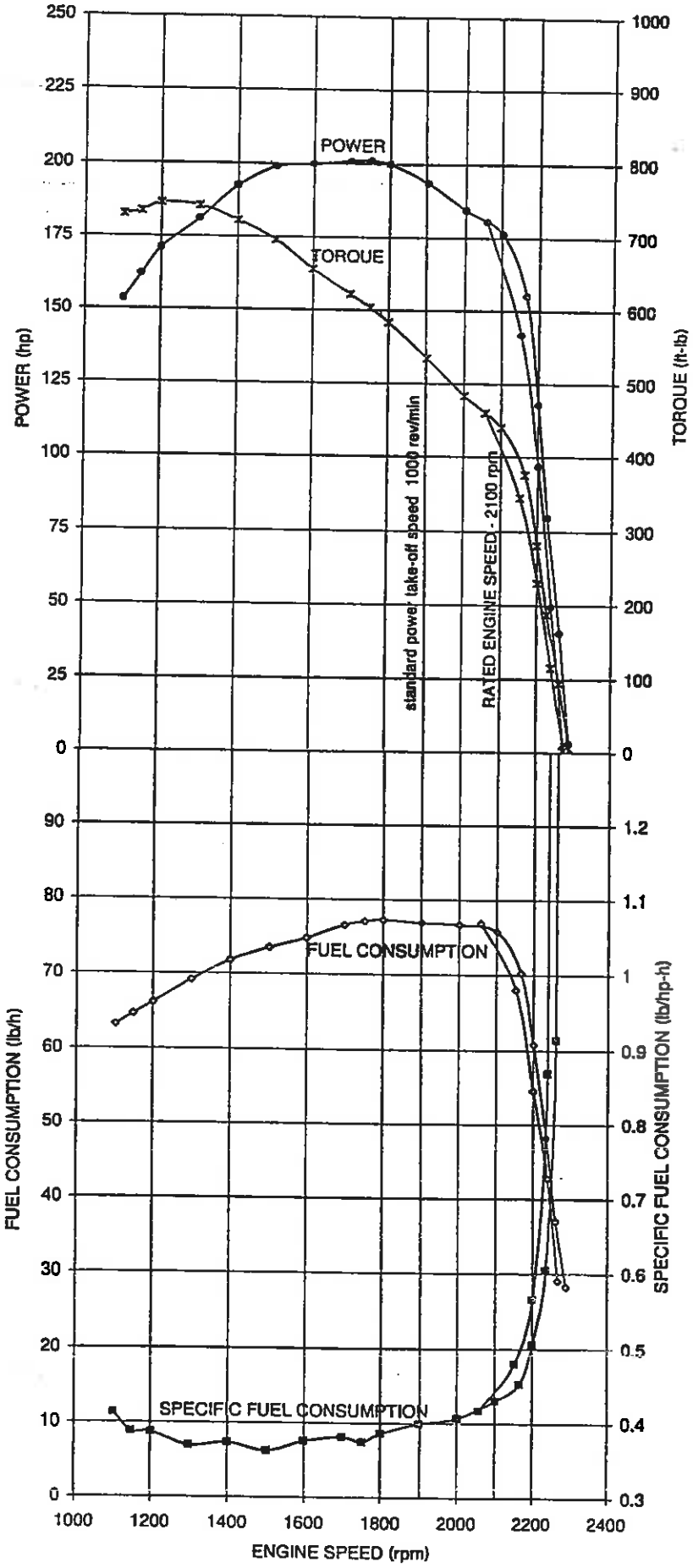
Bruce Allen, P.Eng., MBA
Station Manager for the Director

Date: June 10/96

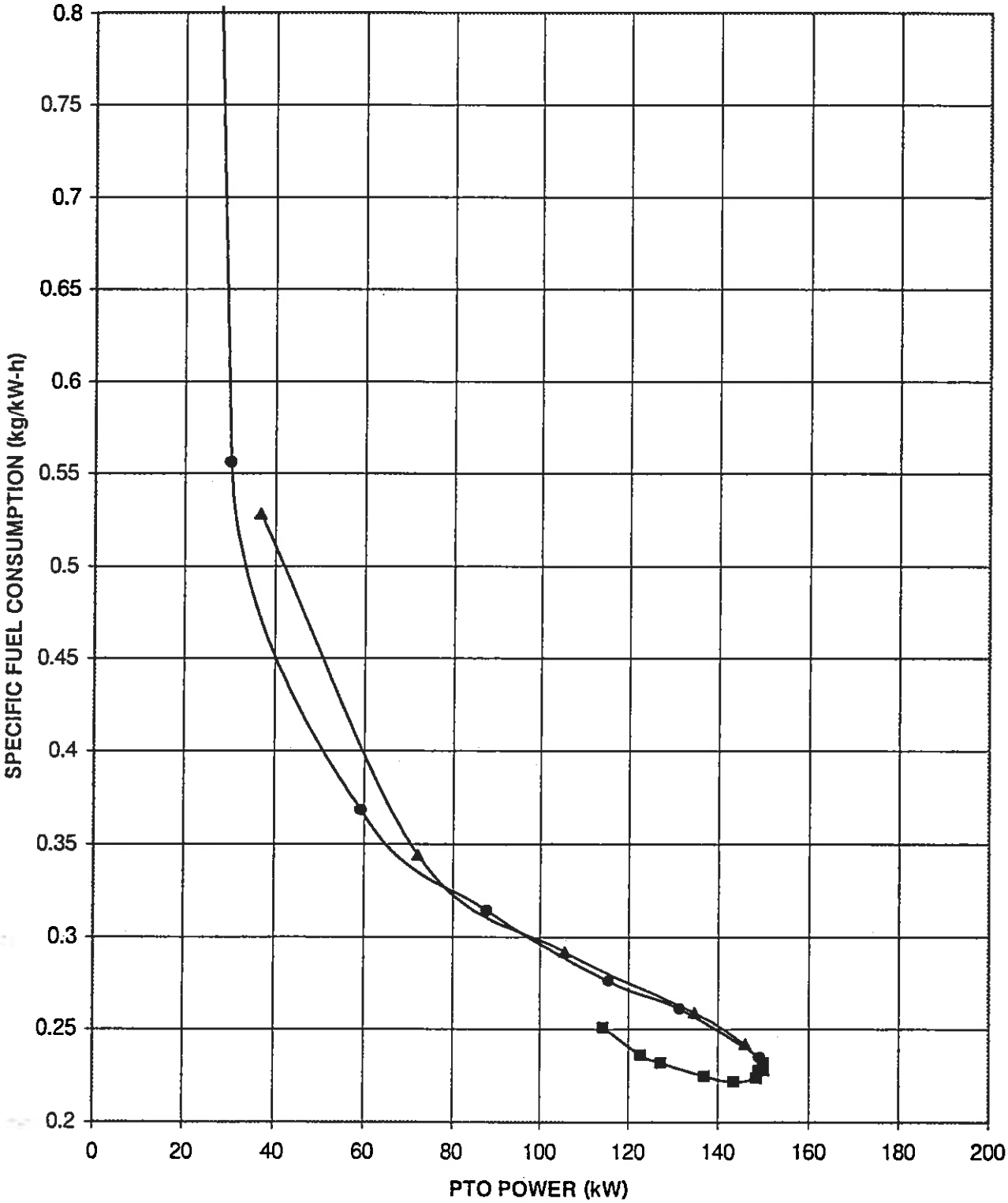
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