

# Evaluation Report

# 565



## Cereal Implements Model 1150 Pneumatic Distribution System

A Co-operative Program Between



## CEREAL IMPLEMENTS MODEL 1150 PNEUMATIC DISTRIBUTION SYSTEM

### MANUFACTURER:

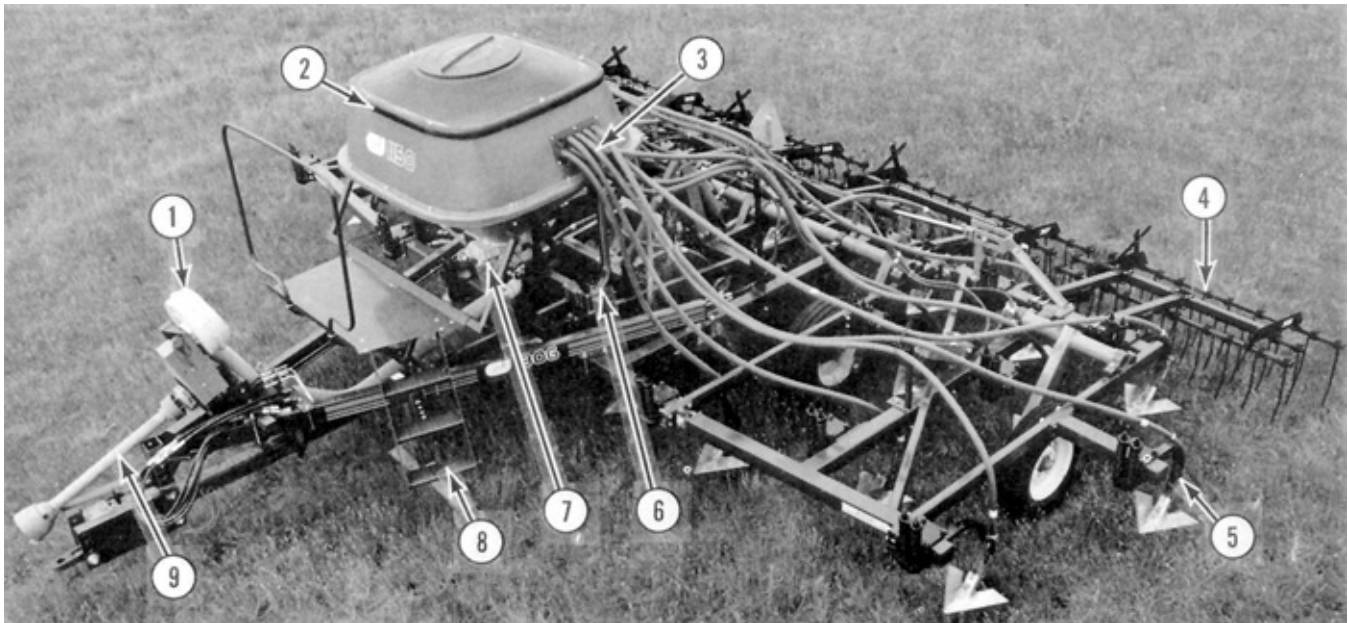
Vicon Western Canada  
P.O. Box 3200  
1000 - 6th Avenue N.E.  
Portage La Prairie, Manitoba  
R1N 3R3

### DISTRIBUTOR:

Cereal Implements  
P.O. Box 3200  
Portage La Prairie, Manitoba  
R1N 3R3

### RETAIL PRICE:

(August, 1988, f.o.b. Lethbridge, Alberta).  
\$ 8,162.00 a) CI 1150 Pneumatic Distribution System,  
Mounting Package and boots.  
\$14,605.00 b) CI 806 25 ft (7.6 m) Chisel Plow c/w Tine  
Harrows and 16 in (406 mm) sweeps.



**FIGURE 1.** Cereal Implements Model 1150 Pneumatic Distribution System: (1) Fan, (2) Tank, (3) Secondary Hose, (4) Optional Harrows, (5) Seed Boot, (6) Tank Mounting Brackets, (7) Metering System, (8) Ladder, (9) PTO Drive.

### SUMMARY OF RESULTS

**Quality of Work:** The CI 1150 pneumatic distribution system was mounted on a 25 ft (7.6 m) chisel plow which maintained adequate penetration and seed placement providing good emergence in moist field conditions. Plants emerged in distinct rows in band widths ranging from 3.2 to 6.2 in (81 to 157 mm). This spacing provided adequate windrow support providing light crops were laid across the rows rather than parallel to them.

Accuracy of the manufacturer's metering system calibration charts was fair in wheat, barley, canola and fertilizer. Measured rates were up to 18.5% high. Operating on slopes (up to 10 degrees), variations in fan speed and field bounce had little effect on metering rates. Variations in ground speed increased the seeding rate by as much as twenty percent. The distribution uniformity was good in all materials tested. Grain damage was acceptable in canola. The maximum fertilizer application rate at 5 mph (8 km/h) was 307 lb/ac (348 kg/ha).

**Ease of Operation and Adjustment:** Ease of setting the seeding and fertilizer rates was poor. Tank and meter cleanout convenience was good. Tank filling required the use of an auger or drill fill. A total of eight grease fittings on the applicator required greasing. With the applicator being mounted on the cultivator, operator visibility of the cultivator's main frame section was fair. The CI 1150 and

CI 806 heavy duty chisel plow could be placed into transport position in less than five minutes.

**Ease of Installation:** Ease of installing the hopper, fan and housing, meter drive wheel, distribution and monitoring system was good. It took one person approximately 8 hours to install the system.

**Operator Safety:** Operation of the CI 1150 pneumatic distribution system was safe provided normal safety procedures were observed.

**Operator's Manual:** The operator's manual and parts list was updated during the evaluation. The new operator's manual was good, containing useful information on adjustments, maintenance and operation.

**Mechanical Problems:** A number of manufacturer modifications occurred during the evaluation.

### RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Improving the accuracy of all calibration charts.
2. Modifying the metering system so ground speed will not affect the seeding rate.
3. Modifying the meter assembly to allow for easier rate setting and eliminating meter drift.

4. Relocating the hopper sensor to improve its effectiveness.
5. Supplying the equation to calculate the area covered in acres.

Station Manager: R. P. Atkins

Project Technologist: G. A. Magyar

## THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Meter rate charts are a starting guide. Actual application rate should always be checked under actual seeding (fertilizing) conditions to obtain best results.
2. Actual application rate check using average operating ground speed would permit the operator to accurately verify his application rate.
3. The meter should be slowly rotated while adjusting the meter rate setting. This will allow material to fall out of the meter flutes and prevent binding.
4. Provision has been provided to:
  - a) Move the sensor up or down on the 6" delivery stack.
  - b) A pivot is provided between the sensor and its mounting clamp so it can be pivoted between horizontal and vertical. The more vertical the sensors face, the less material remains against the sensor, sending a fake reading.
5. a) Installation of Decal:  
Divide area counter by 400 to convert to acres (last 2 numbers on right will provide 1/10 and 1/100 acres).  
eg. meter has 5 numbers.  
1 2 3 4 5 + 400 = 30.86 (acres)  
0 0 0 4 5 + 400 = 0.00025 (1/10th acres)  
b) An optional acre counter can be made available which will require minimal mounting modification.

## GENERAL DESCRIPTION

The Cereal Implement Model 1150 Pneumatic Distribution System is a seed or fertilizer applicator designed for use on various makes and models of cultivators with up to thirty-two shanks. The hopper and fan assembly are secured to the centre section of the cultivator frame. The meter drive wheel is attached to the front cross member of the cultivator so that the land wheel will be centered over the right implement tire. A hitch drawbar extension is inserted on the CI 806 chisel plow to accommodate the pto driveline. Seed or fertilizer is pneumatically distributed from the tank distribution head through a network of tubes to seed boots attached to the rear of the cultivator shanks. The applicator can be used for seeding or for fertilizer banding.

The seed or fertilizer is metered through an adjustable externally fluted roller. A power take-off driven fan conveys the metered material through the distribution system. The distribution system consists of a thirty-two port distribution header located in the hopper. Tubes connect the distribution header to the seed boots. The test machine was also equipped with a hopper level indicator.

The test machine was used with a CI Model 806 heavy duty chisel plow (Evaluation Report #568). This chisel plow was 25.6 ft (7.8 m) wide, with a 13.0 ft (4.0 m) center frame and two, 6.0 ft (1.8 m) wing sections. It was equipped with 25 spring cushion shanks spaced at 12 in (305 mm) arranged in four rows. The chisel plow was equipped with optional three-row mounted harrows. A tractor with two remote hydraulics and a 1000 rpm

pto drive was required to operate the Model 1150 applicator with the CI Model 806 heavy duty chisel plow.

## SCOPE OF TEST

The Model 1150 was operated in the field conditions shown in Table 1 for approximately 36 hours while processing about 450 ac (182 ha). It was evaluated for quality of work, ease of operation and adjustment, power requirement, ease of installation, safety and suitability of the operator's manual. In addition laboratory testing of the metering and distribution system was carried out before and after field testing.

TABLE 1. Operating Conditions

MATERIAL	SOIL-TILLAGE CONDITIONS	STONE CONDITIONS	FIELD AREA ac (ha)	HOURS
Canola	Silty Clay Loam Secondary	Stone Free	120 (49)	8.0
Barley	Silt Loam Primary	Occasional	40 (16)	3.5
Wheat	Silty Clay Loam Primary	Occasional	90 (36)	7.5
Rye	Silt Loam Primary	Moderately	200 (81)	17.0
TOTAL			450 (182)	36.0

## RESULTS AND DISCUSSION

### QUALITY OF WORK

**Seed Placement:** The seed placement of the Model 1150 was good. The Model 1150 was equipped with a v-shaped seed boot (FIGURE 2) to spread material behind the cultivator sweep. Plants emerged in distinct rows in band widths ranging from 3.2 to 6.2 in (81 to 157 mm). With a 12 in (305 mm) cultivator shank spacing, distances between rows varied from 5.8 to 8.8 in (147 to 223 mm). The row spacing provided adequate windrow support providing light crops were laid across the rows rather than parallel to them.

Careful levelling of the cultivator frame was important in obtaining uniform plant emergence across the cultivator width. Uniform seed depth placement was best obtained by comparing the seed depth of several shanks across the cultivator width and comparing the front and rear shank rows.

On level and gently rolling fields, vertical seed distribution was uniform. At a set depth of 2 in (51 mm), sweep depth across the width of the machine varied from 1.5 to 2.5 in (38 to 64 mm) with most of the seeds placed within 0.5 in (13 mm) of the average cultivator sweep working depth. This compares to seed being placed from 0.5 to 0.6 in (12 to 15 mm) from average seeding depth for a hoe drill in similar conditions. Working in fields with hill crests or gullies, seed depth variation was greater because of the larger distances between shank rows. Frame levelling should be checked and appropriate depth adjustments made when changing fields to ensure adequate, uniform seed coverage.

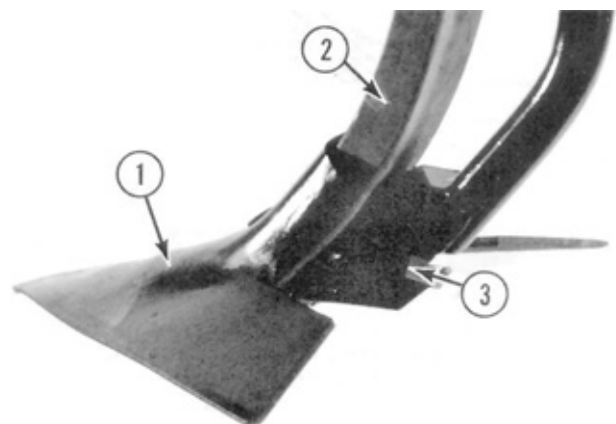


FIGURE 2. CI 1150 Seed Boot (1) sweep, (2) shank, (3) seed boot.

**Soil Finishing:** With the applicator being mounted on the cultivator frame the seedbed left by the unit was in very good condition. It was considered essential to level and pack fields seeded with the Model 1150. A packer drawbar or harrow packer drawbar was used as a follow-up operation. The packer or harrow-packer combination served to smooth and pack the seedbed, leaving packer ridges from 1 to 1.3 in (25 to 33 mm). To obtain a smooth firm seedbed in dry conditions required packer-drawbar operation in two directions. Care had to be used in moist conditions to avoid over-packing the seedbed.

**Metering Accuracy:** Metering accuracy of the Model 1150 was fair in all materials tested. The metering rate was varied by adjusting the barrel sleeve to increase or decrease amount of wheel area exposed to the material. Calibration curves for wheat, barley, canola, and fertilizer are given in FIGURES 3 to 6. At a seeding rate of 75 lb/ac (85 kg/ha) in both wheat and barley, PAMI's measured rate was 14.7% higher than the manufacturer's. At a seeding rate of 6.0 lb/ac (6.7 kg/ha) in canola, PAMI's measured rate was 20% lower than the manufacturer's. At an application rate of 60 lb/ac (68 kg/ha), PAMI's measured rates in 11-51-00 fertilizer was 18% higher than the manufacturer's while at an application rate of 150 lb/ac (170 kg/ha) the measured rates were 2% lower than the manufacturer's. It is recommended that the manufacturer consider improving the accuracy of all calibration charts supplied.

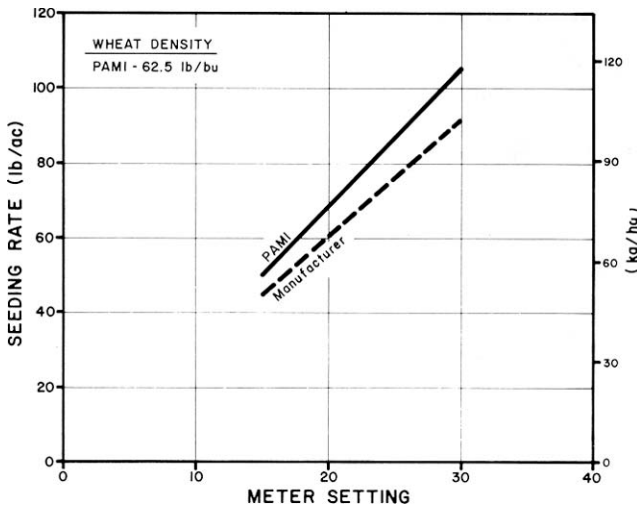


FIGURE 3. Metering Accuracy in Wheat.

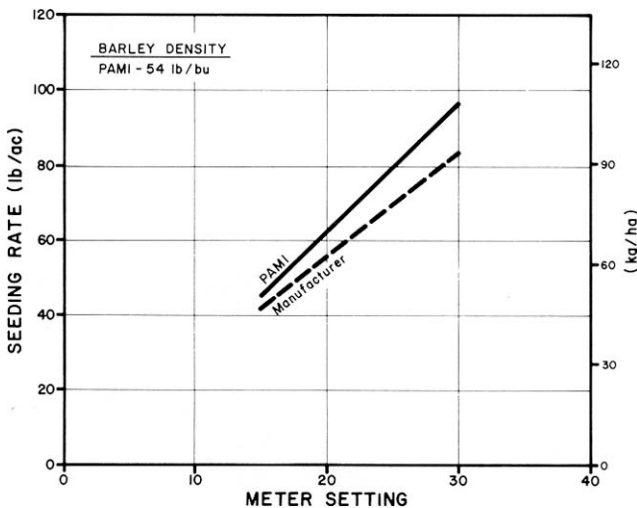


FIGURE 4. Metering Accuracy in Barley.

Operating on slopes (up to 10 degrees), variations in fan speed and field bounce had little effect on metering rates. Variations in ground speed did affect the metering rates. At a ground speed of 2.5 mph (4 km/h) the seeding rate in wheat (FIGURE 7) was 76 lb/ac (86 kg/ha) while at a ground speed of 7.5 mph (12 km/h) the seeding rate was 64 lb/ac (72 kg/ha).

Variations in ground speed also affected the seeding rate when applying canola (FIGURE 8). At a ground speed of 2.5 mph (4 km/h) the seeding rate was 6.1 lb/ac (6.9 kg/ha) while at a ground speed of 7.5 mph (12 km/h) the seeding rate was 4.9 lb/ac (5.6 kg/ha). It is recommended that the manufacturer consider modifying the metering system so ground speed will not affect the metering rate.

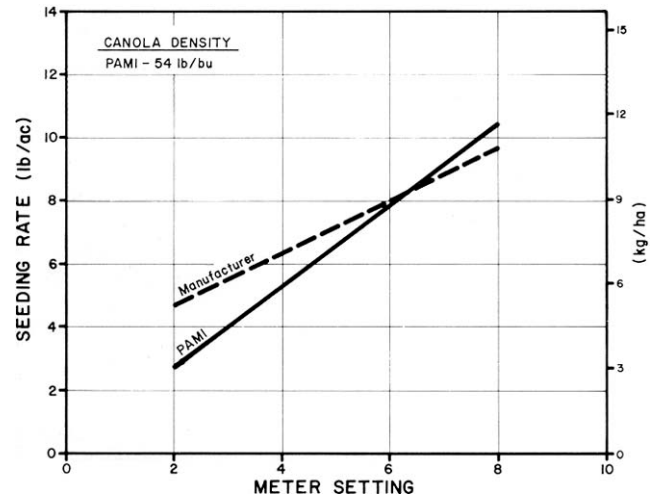


FIGURE 5. Metering Accuracy in Canola.

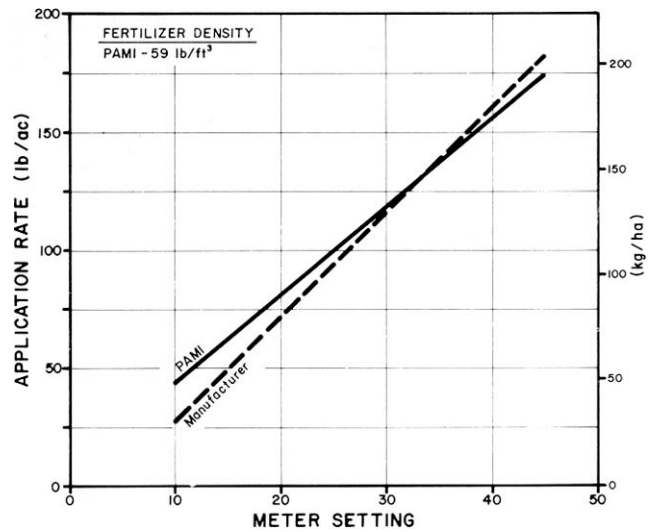


FIGURE 6. Metering Accuracy in Fertilizer.

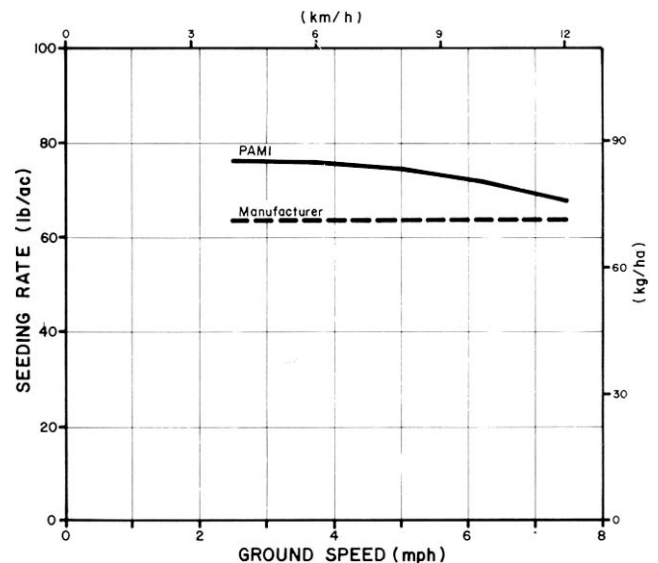


FIGURE 7. Effect of Ground Speed on Metering Rate in Wheat.

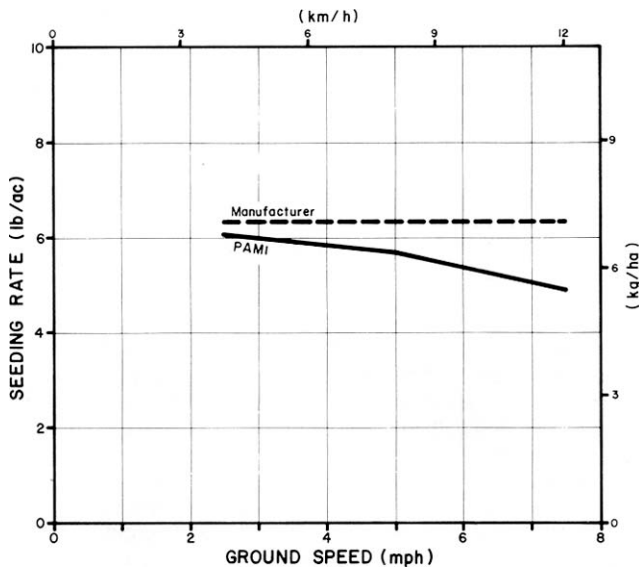


FIGURE 8. Effect of Ground Speed on Metering Rate in Canola.

**Distribution Uniformity:** The distribution uniformity was good in wheat, barley, fertilizer and canola. FIGURE 9 gives seeding distribution uniformity for the Model 1150 in wheat and barley. Distribution was uniform over the full range of seeding rates at a fan speed of 1000 pto rpm. At a seeding rate of 75 lb/ac (85 kg/ha), the co-efficient of variation (CV)<sup>1</sup> was 6.9% for wheat and at a seeding rate of 65 lb/ac (74 kg/ha) the co-efficient of variation was 7.8% for barley. FIGURE 10 shows a typical seeding distribution pattern obtained in wheat at a seeding rate of 74.6 lb/ac (84.8 kg/ha). The seeding rate from each shank across the width of the air seeder varied from 65 to 85 lb/ac (74 to 96 kg/ha). This resulted in acceptable distribution uniformity with a CV of 6.9%. FIGURE 11 shows a typical distribution pattern obtained in canola at a seeding rate of 5.6 lb/ac (6.4 kg/ha), which resulted in acceptable distribution uniformity with a CV of 10.1%. Distribution uniformity was acceptable over the full range of canola seeding rates with CV's ranging from 9.1 to 10.6% (FIGURE 12).

Distribution uniformity in 11-51-00 fertilizer was acceptable over the full application range with a CV ranging from 9.0 to 11.0% (FIGURE 13).

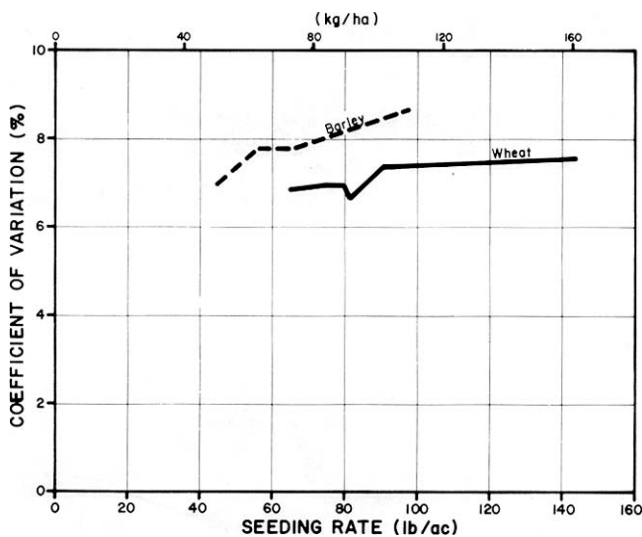


FIGURE 9. Distribution Uniformity in Cereal Grains Over a Range of Seeding Rates at 5.0 mph (8 km/h) and 1000 PTO rpm.

<sup>1</sup>The Co-efficient of Variation (CV) is the standard deviation of seeding rates from individual shanks expressed as a percent of the average seeding rate. An accepted variation for seeding grain or applying fertilizer is a CV value not greater than 15%. If the CV is less than 15%, distribution is acceptably uniform, whereas if the CV is greater than 15%, the variation in application rate among individual shanks is excessive.

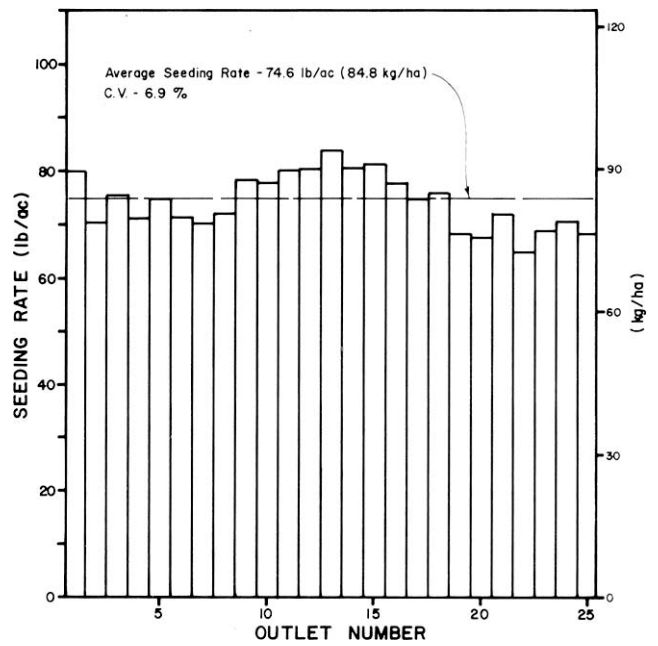


FIGURE 10. Distribution Uniformity Pattern in Wheat at 74.6 lb/ac (84.8 kg/ha) at a Fan Speed of 1000 PTO rpm.

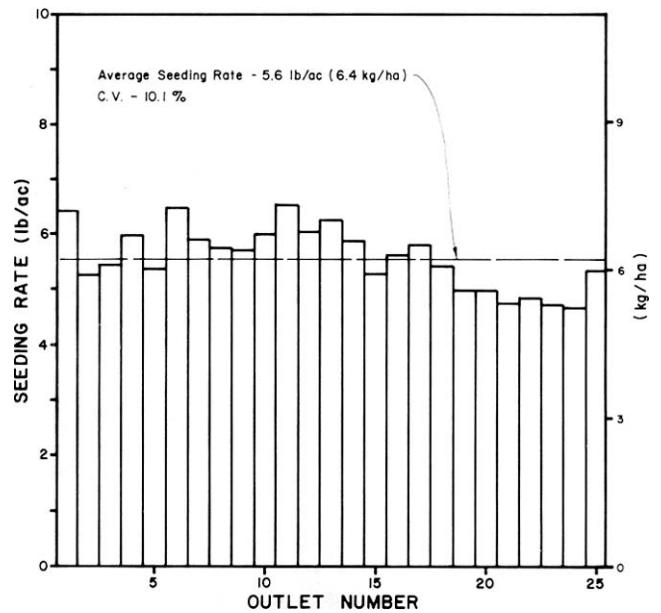


FIGURE 11. Distribution Uniformity Pattern in Canola at 5.6 lb/ac (6.4 kg/ha) and a Fan Speed of 1000 PTO rpm.

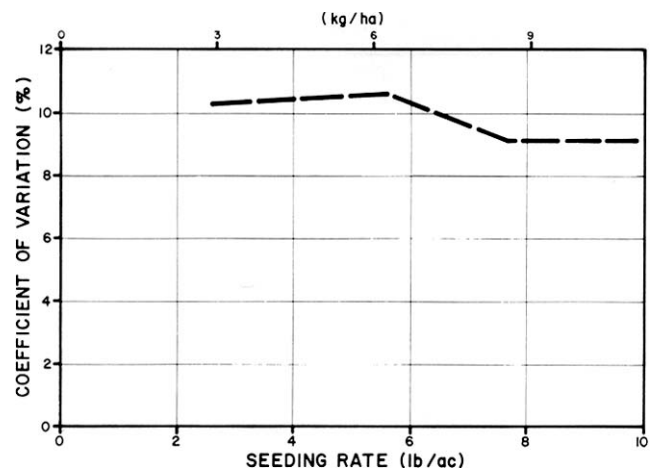


FIGURE 12. Distribution Uniformity in Canola Over a Range of Seeding Rates at 5 mph (8 km/h) and 1000 PTO rpm.

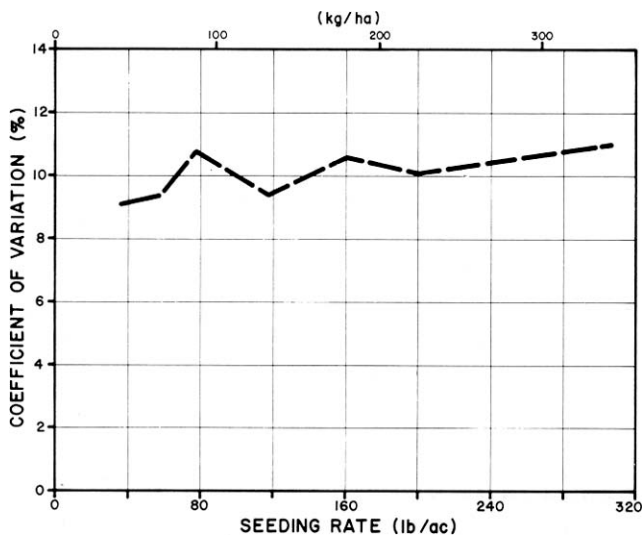


FIGURE 13. Distribution Uniformity in Fertilizer Over a Range of Application Rates at 5 mph (8 km/h).

Changes in distribution pattern uniformity could occur at different forward speeds or for different machine widths due to different volumes of material being introduced into the constant volume of air supplied by the fan. Changes in fan speed and operation in hilly terrain had only a small effect on distribution uniformity.

**Grain Damage:** Grain damage by the metering and distribution was within acceptable limits for all materials. For example, canola crackage was only 0.9% at rated fan speeds.

**Fertilizer Banding:** When the cultivator was equipped with chisel points or sweeps (FIGURE 14), the Model 1150 could be used for fertilizer banding. No special banding boot was required; when the v-shaped spreader was removed the general all-purpose boot served as the banding boot. While maintaining an acceptable distribution uniformity, the maximum application rate of 307 lb/ac (348 kg/ha) was possible at a ground speed of 5 mph (8 km/h).

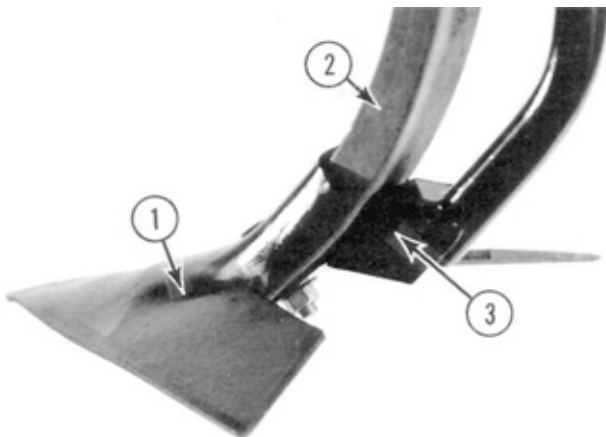


FIGURE 14. C11150 Banding Boot: (1) Sweep, (2) Cultivator Shank, (3) All-Purpose Boot.

### EASE OF OPERATION AND ADJUSTMENT

**Maintenance:** Ease of performing routine maintenance was good. Lubrication was convenient with good access to all grease fittings. The fan assembly, pto driveline and the ground drive sprocket required greasing every 10 hours. The meter drive chain supplied was inspected every 50 hours as to tightness. A service schedule was supplied in the operator's manual.

**Filling/Cleaning:** Ease of filling/cleaning the air seeder was good. The large 21.3 in (541 mm) diameter tank opening gave ample room for drill fill or auger filling. No loading auger was supplied. With the distribution header located in the tank it was

essential that the drill fill or auger have a flexible spout thus enabling complete filling of the tank. The filler opening was located 7.9 ft (2.4 m) above ground. The filler lid was screwed down to seal the tank. The tank held 42 bu (1527 L).

A cleanout opening was located at the front of the meter housing (FIGURE 15). Access to the meter was not possible without emptying the tanks.

**Transporting:** Ease of transporting the Model 1150 with the Model 806 chisel plow was good.

The applicator/cultivator unit was easily attached to the tractor. Hook-up of four hydraulic lines, one electronic coupler and the pto driveline was required. Since the applicator was mounted on the cultivator (FIGURE 16), visibility and maneuverability of the applicator/cultivator unit was good. The meter drive wheel was engaged and disengaged when the cultivator was raised or lowered. Overall transport height and width were 10.1 ft (3.1 m) and 16.3 ft (5.0 m) respectively, requiring care when travelling on public roads.

**Monitoring:** The test machine was equipped with a hopper level indicator which warned the operator when the hopper was empty. With the sensor being located at the bottom of the hopper, the light came on when there was not a sufficient reserve of material to seed another acre. It is recommended that the manufacturer consider relocating the sensor to provide for earlier warning prior to the tank being empty.

The Model 1150 was equipped with a meter drive shaft revolution counter for area measurement. The area meter recorded hectares to the nearest one thousandths. The counter gave a reading of about 3% high which was considered acceptable. No conversions were supplied to convert to acres.

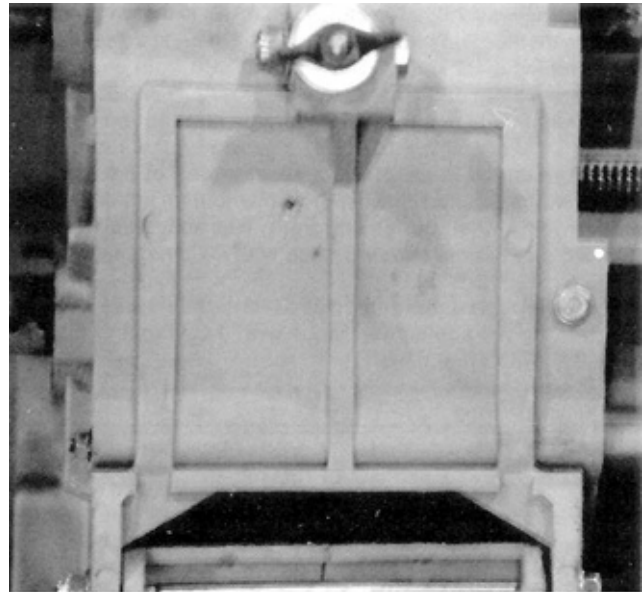


FIGURE 15. Meter Cleanout Lid.

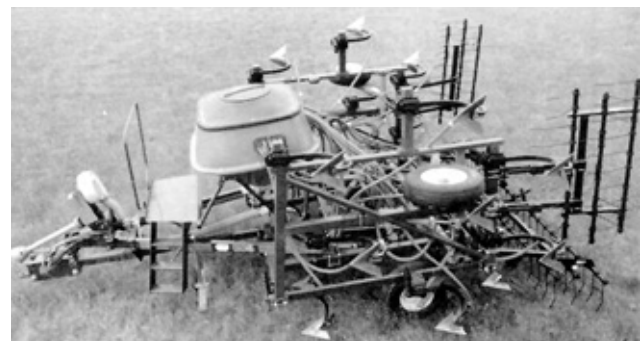


FIGURE 16. Transport Position.

**Seeding and Fertilizer Rates:** Ease of setting the seeding and fertilizer rates was poor. The application rate was changed by turning the crank handle thus varying the amount of exposed area of the roller to the material (FIGURE 17). Being awkward to turn, the small crank handle made it difficult to set new application rates. It was also difficult to reduce the application rate with material in the meter assembly. After the rate had been set, periodical inspection was required to ensure the meter setting remained at the desired rate, since the meter assembly would drift from the desired setting. It is recommended that the manufacturer consider modifying the meter assembly to allow for easier rate setting and to eliminate meter drift.

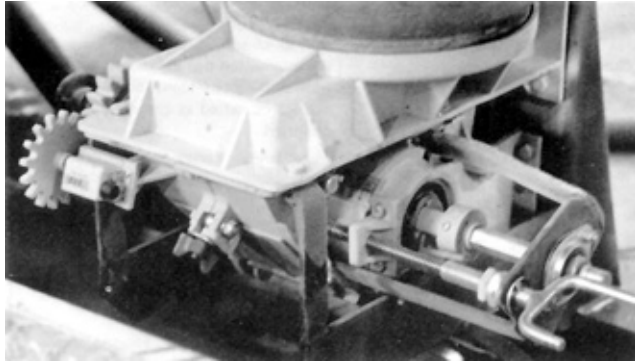


FIGURE 17. Model 1150 Meter Assembly.

### EASE OF INSTALLATION

Ease of installing the Model 1150 system onto the Model 806 heavy duty chisel plow was good. The installation of the distribution system included mounting the applicator tank onto the frame of the cultivator, mounting the support bracket and step to the cultivator frame and applicator tank, mounting the meter drive wheel to the cultivator frame, adding the hitch extension to the cultivator and installing the fan drive and housing on the hitch frame of the cultivator. The 4 in (102 mm) primary hose was connected from the fan housing to the injector elbow located at the bottom of the meter assembly. The 1.25 in (32 mm) distribution hoses were connected to the primary header located inside the tank and then routed through the appropriate port opening to the seed boots attached to the cultivator shank. Tube holders were mounted on the cultivator to help support the distribution hoses. The hopper level light was mounted in the tractor cab and the electrical harness was routed to the applicator. A hoist or front end loader allowed for easier mounting of the applicator onto the cultivator. It took one person approximately 8 hours to install the CI 1150 pneumatic distribution system.

### POWER REQUIREMENTS

The draft (drawbar pull) and corresponding tractor horsepower requirements depended on the size and type of cultivator used. Refer to PAMI reports on cultivators for estimates of draft and horsepower requirements. With the system mounted directly on the cultivator frame, there was no measurable effect on the draft of the cultivator. The power take-off driven fan required 7.2 hp (5.2 kW) under typical operating conditions.

### OPERATOR SAFETY

The CI 1150 access ladder and platform was convenient and safe. A safety handrail was provided at the edge of the platform. The applicator/cultivator system towed well at speeds up to 20 mph (32 km/h).

Total engine and fan noise level at the tractor hitch point was 97 dbA. This increased the operator station level in most modern tractor cabs by only 1 dbA. Suitable ear protection should be worn if the tractor is not equipped with an appropriate cab.

### OPERATOR'S MANUAL

The operator's manual was very good. The operator's manual for the Model 1150 contained useful information on safety, assembly, adjustment, specifications, maintenance and operation. A detailed parts list was also included. Calibration charts, calibrated in pounds per acre and kilograms per hectare were included in the operator's manual.

### MECHANICAL HISTORY

Table 2 outlines the mechanical history of the C11150 pneumatic distribution system during 36 hours of operation while processing about 450 ac (182 ha). The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted.

TABLE 2. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
The following modifications were at beginning of test			
- Applicator step was altered to allow for mounting on the cultivator			
- Meter lock for fine to course setting broke and meter was replaced			
- Meter drive system was moved from left side of meter assembly to right side			
- Meter chain shield was bent and replaced			
- With addition of hitch extension cultivator hoses were lengthened			
- Electrical harness would not reach tractor cab and was lengthened			
- Support chain for meter drive wheel was added			
Metering charts were inaccurate and updated at	15	180	(73 ha)
New electrical harness was supplied at	25	270	(109 ha)
Manufacturer made the following modifications at end of test:			
- Jack mount added to hitch extension			
- New step designed for easier mounting			
- New location of support chain for meter wheel			
- Warning label added to tank lid			

### MANUFACTURER'S MODIFICATIONS TO THE APPLICATOR

Modifications to the Model 1150 included the installation of a jack mount on the hitch extension, new design of the step to the applicator, improved location for support chain on meter wheel, supplying an extension cable for hopper sensor indicator, addition of warning label on tank lid and updated calibration charts.



**APPENDIX I  
SPECIFICATIONS**

<b>MAKE:</b>	Cereal Implements
<b>MODEL:</b>	1150
<b>SERIAL NUMBER:</b>	66009/000008
<b>MANUFACTURER:</b>	Vicon Western Canada P.O. Box 3200 1000 - 6th Avenue N.E. Portage La Prairie, Manitoba R1N 3R2
<b>DIMENSIONS:</b>	
- width	5.8 ft (1.8 m)
- length	5.0 ft (1.5 m)
- height	5.8 ft (1.8 m)
<b>METERING SYSTEM:</b>	
- type	plastic externally fluted meter, non-pressurized tank
- number of meters	one
- drive	chain drive from meter wheel off implement tire
- adjustment	threaded adjustment for length of flute exposure
- airstream loading	Venturi
- transfer to openers	pneumatic conveyance through a divider header and hoses
- number of outlets	32
<b>TANK CAPACITIES:</b>	
- main tank	42 bu (1527 L)
<b>FAN:</b>	
- type	centrifugal
- maximum operating speed	rpm
- drive	tractor power take-off - 1000 rpm
<b>NUMBER OF LUBRICATION POINTS:</b>	8 grease fittings
<b>WEIGHTS:</b>	
- hopper	540 lb (245 kg)
- hopper with accessories	920 lb (418 kg)

**APPENDIX II  
MACHINE RATINGS**

The following rating scale is used in PAMI Evaluation Reports:

- Excellent
- Very Good
- Good
- Fair
- Poor
- Unsatisfactory

**SUMMARY CHART  
CI 1150 PNEUMATIC DISTRIBUTION SYSTEM**

<b>RETAIL PRICE:</b>	(August, 1988 f.o.b. Lethbridge) a) CI 1150 Pneumatic Distribution System, Mounting Package and seed boots \$8,162.00 b) CI 806 25 ft (7.6 m) Chisel Plow c/w Tine Harrows and 16 in (406 mm) sweeps \$14,605.00
<b>QUALITY OF WORK:</b>	
Seed Placement:	<b>good;</b> band widths ranged from 3.2 to 6.2 in (81 to 157 mm). Seed depth varied from 1.5 to 2.7 in (38 to 69 mm)
Metering Accuracy:	<b>fair;</b> all charts were updated during the evaluation but measured rates were still inconsistent for all materials. Rates varied as ground speed changed.
Distribution Uniformity:	<b>good;</b> wheat, barley and fertilizer fair; canola
<b>EASE OF OPERATION AND ADJUSTMENT:</b>	
Filling/Cleaning:	<b>good;</b> filling required use of auger or drill fill.
Transporting:	<b>good;</b> placed in transport in less than five minutes.
Seeding and Fertilizer Rates:	<b>poor;</b> rate was hard to change and meter setting would drift.
<b>EASE OF INSTALLATION:</b>	<b>good;</b> took one person about 8 hours to install.
<b>OPERATOR SAFETY:</b>	safe, provided normal safety precautions were taken.
<b>OPERATOR'S MANUAL:</b>	<b>good;</b> well written and clearly illustrated.
<b>MECHANICAL HISTORY:</b>	a number of manufacturer modifications occurred during the evaluation period.



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