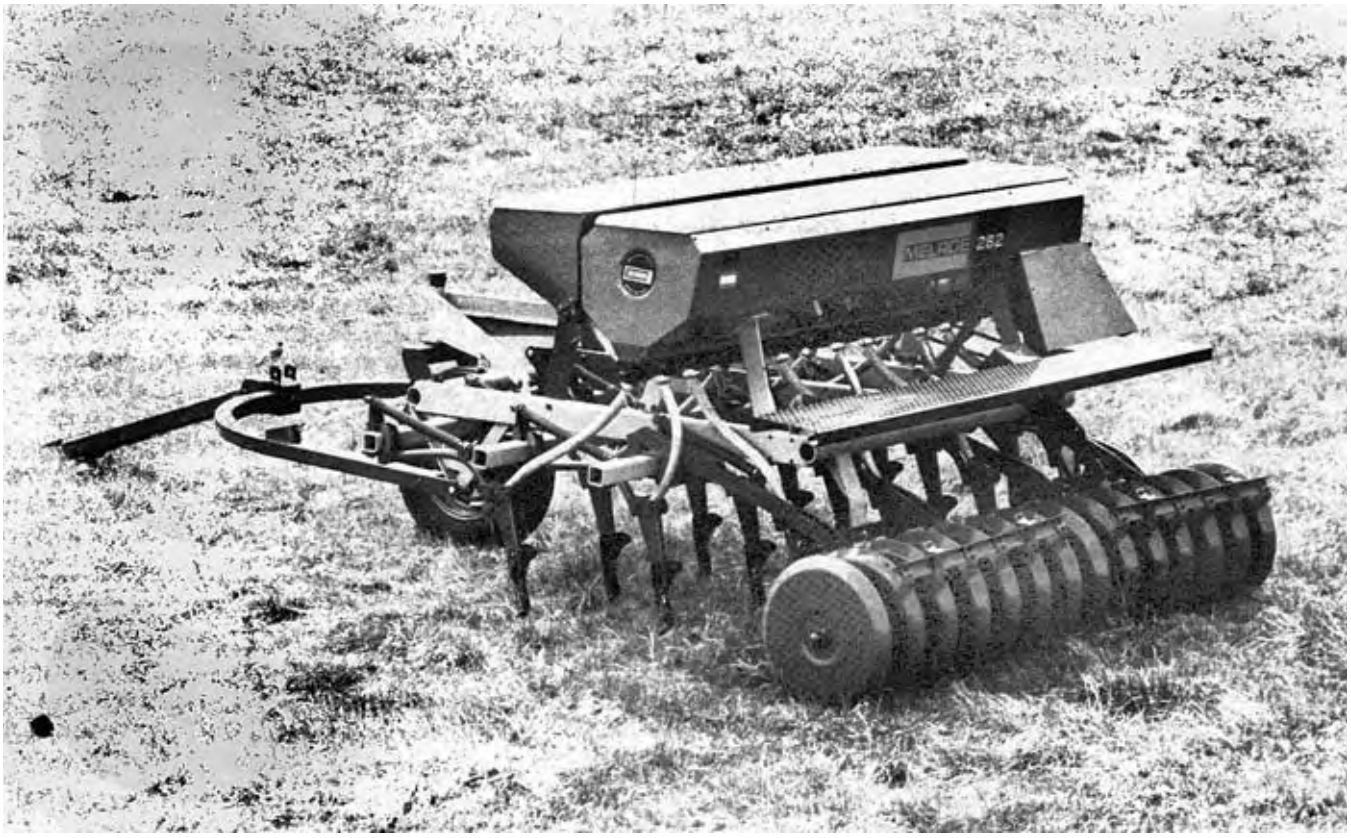
Evaluation Report No. E1979A
Printed: September, 1980
Tested at: Lethbridge
ISSN 0383-3445

Evaluation Report 173



Melroe 282-147 Grain and Fertilizer Drill

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

MELROE 282-147 GRAIN AND FERTILIZER DRILL

MANUFACTURER AND DISTRIBUTOR:

Lilliston Corporation
P.O. Box 3930
Albany, Georgia 31708

RETAIL PRICE:

$5,117.00 (July, 1980, f.o.b. Lethbridge complete, with dry fertilizer attachment, double feed cup kit, low rate kit, acre meter and single hitch).

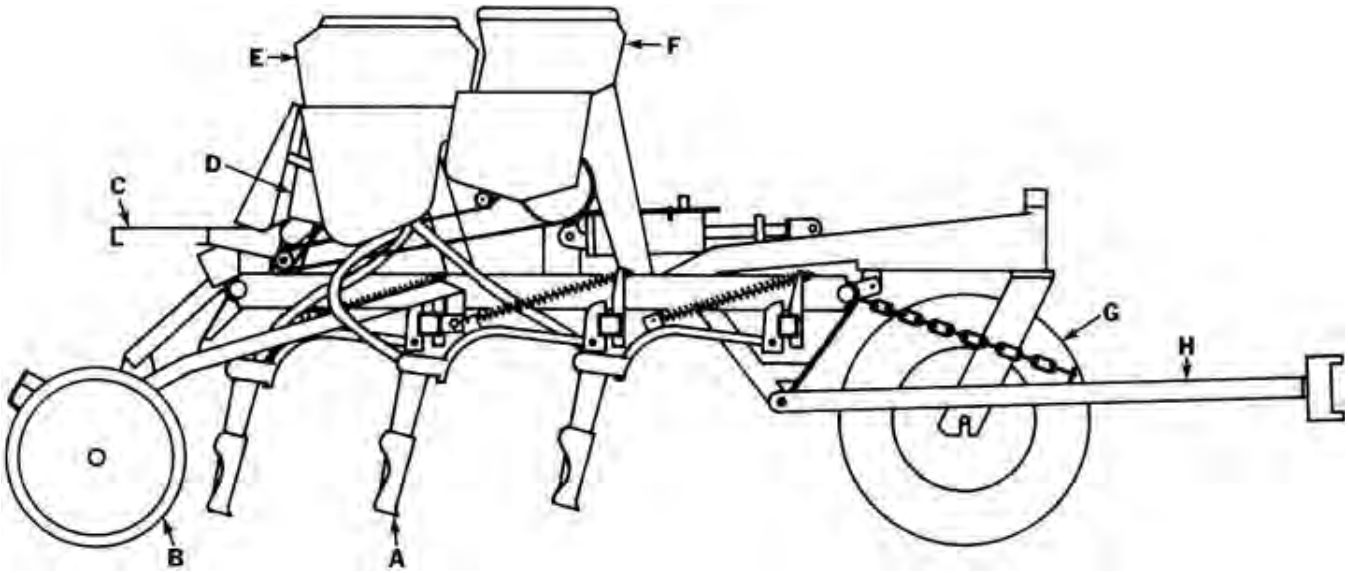


FIGURE 1. Melroe 282-147: (A) Hoe Opener, (B) Press Wheel, (C) Walkway, (D) Grain Feed Wheel Drive Gearbox, (E) Grain Box, (F) Optional Fertilizer Attachment, (G) Castor Wheel, (H) Hitch.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Melroe 282-147 was very good. Penetration and seed placement were good in a wide range of soil and trash conditions providing the seedbed had been properly prepared. Press wheel performance, trash clearance, and performance in stony fields were good.

The seed metering, system was fairly accurate in wheat, oats, barley and rapeseed. Variation in seed rates among seed runs was insignificant. The minimum seeding rate in rapeseed was 3 kg/ha (2.7 lb/ac). Seeding rate was not affected by level of grain in the grain box or field bounce. Forward speed and slope had a slight effect on seeding rate.

Overall performance of the fertilizer attachment was fair. Its performance was reduced by large variation in application rate with changes in field slope and variation in distribution across the seeding width. The manufacturer's calibration chart was fairly accurate. Level of fertilizer in the fertilizer box and field vibration had no effect on fertilizing rate, but forward speed affected rate slightly.

A grass seeding attachment was available as optional equipment but was not evaluated. Seeds such as alfalfa and ryegrass could be seeded through the grain box, but large light seeds such as bromegrass bridged over the seed cups.

Both the seed and fertilizer rates were convenient to adjust. Seed and fertilizer boxes were convenient to fill and an adequate walkway was provided. Cleaning was easy and only one lubrication fitting required greasing.

Tractor size needed depended on field preparation and soil. Tractor size needed to pull one 2.5 m (8.2 ft) section of Melroe 282-147 at 8 km/h (5 mph) ranged from 27 kW (36 hp) in fine sandy loam to 32 kW (43 hp) in clay loam.

The operator's manual contained comprehensive instructions on adjustment, maintenance and operation. No detailed parts list was provided. The calibration charts provided in the operator's manual were different than those provided on the grain drill box lid, which was confusing when calibrating the drill.

Minor mechanical problems occurring during functional evaluation included failure of an opener shank weld, wearing out of a grain tube clip hole, and breaking of two of the plastic fertilizer drop tubes when attempting to remove the tubes.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Changing the application calibration charts in the operator's manual to agree more closely with the charts provided on the drill.
2. Providing a slow moving vehicle emblem.

Chief Engineer: E. O. Nyborg
Senior Engineer: E. H. Wiens
Project Engineer: K. W. Drever

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. The operator's manual will be reprinted and the calibration chart in the manual will agree with the chart on the hopper lid.
2. This recommendation is being taken under consideration.

MANUFACTURER'S COMMENTS

Lilliston Corporation has purchased the Melroe grain drill from Clark Equipment Company and has assumed all production and sale responsibilities.

The fertilizer attachment has been redesigned and the wire auger metering system has been replaced with a fluted wheel metering system.

NOTE: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

GENERAL DESCRIPTION

The Melroe 282-147 grain and fertilizer drill is a 2.5 m (8.2 ft) hoe drill with 180 mm (7 in) spacing. It is equipped with14 openers in three rows. Seeding depth is controlled with a hydraulic cylinder. Grain is metered from the 388 L (11 bu) grain box by externally fluted feed wheels through coiled steel tubes to the openers. Two gangs of 515 mm (20.5 in) diameter V-shaped press wheels pack the soil directly behind the openers.

The test machine was equipped with an optional fertilizer attachment. Fertilizer is metered from the 235 kg (517 lb) fertilizer box by wire augers on a round horizontal shaft, through plastic discharge tubes feeding into the grain box drop tubes. Other optional

equipment on the test machine include a double feed cup, low rate kit, acre meter, and single hitch.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Melroe 282-147 was operated in the conditions shown in TABLE 1 for 62 hours while seeding about 104 ha (260 ac). It was evaluated for quality of work, ease of operation, ease of adjustment, power requirements, operator safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

Crop	Soil	Stone Conditions	Field Area ha	Hours
Durum wheat on summerfallow	Silty loam	occasional stones	9	7
	Sandy loam	occasional stones	9	5
Durum wheat on tilled wheat stubble	Silty loam	occasional stones	8	6
	Sandy loam	occasional stones	9	5
Spring wheat on summerfallow	Sandy clay loam	occasional stones	7	4
Spring wheat on stilled rapeseed stubble	Sandy clay loam	occasional stones	20	11
Rapeseed on summerfallow	Clay loam	occasional stones	12	7
Fall rye on summerfallow	Fine sandy loam	moderately stony	14	10
Winter wheat on summerfallow	Clay loam	occasional stones to very stony	15	1 1
Winter wheat on wheat stubble	Heavy loam	occasional stones	1	1
Total			88	62

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: Penetration was good in a wide variety of field conditions provided adequate pre-seeding tillage had been performed. Opener position was controlled by the position of the hydraulic lift cylinder. The hoe assemblies (FIGURE 2) were equipped with a spring cushioned trip and a 38 mm (1.5 in) spear point opener. The spring cushioned trips were effective in providing opener protection in stony fields.

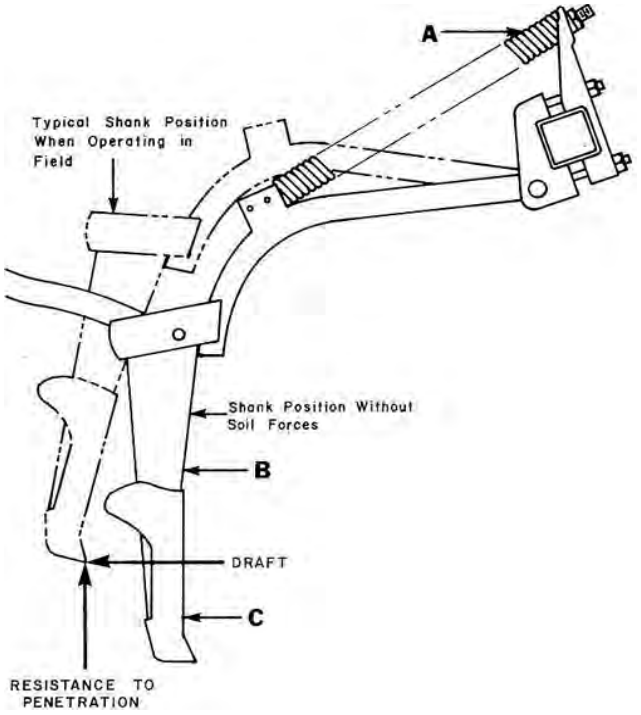


FIGURE 2. Hoe Assembly: (A) Opener Pressure Spring, (B) Shank, (C) Hoe Opener.

Seed Placement: Ideally, grain is seeded into moist soil on a firm seedbed. A firm seedbed aids in the packing of moist soil around the seed and provides a barrier to the seepage of rainfall below the seed zone.

Seed and fertilizer were normally placed about 25 mm (1 in) shallower than the working depth of the hoe opener in a 40 mm (1.6 in) wide band. Measurements of seed depth when seeding wheat indicated that most of the seeds were within 12 mm (0.5 in) of the average seed depth in uniform soil conditions.

Uniform field preparation was required for uniform seed depth due to the opener trip design (FIGURE 2). Soil reaction forces of draft and resistance to penetration caused the shank to rotate back, resulting in changes in seeding depth. Seed depth was fairly uniform on uniform fields but increased in soft spots due to wheel sinking. A typical increase in one clay loam field was 24 mm (1 in).

Soil Compaction: The V-shaped press wheels followed directly behind the openers, effectively pressing soil around the seeds. Press wheel furrow depth ranged from 40 to 65 mm (1.6 to 2.6 in) depending on soil conditions. FIGURES 3 and 4 show the soil surface after seeding in summerfallow and stubble fields. In dry, loose soils, excessive field speeds caused soil pulverization.

FIGURE 3. Soil Surface after Seeding Summerfallow.

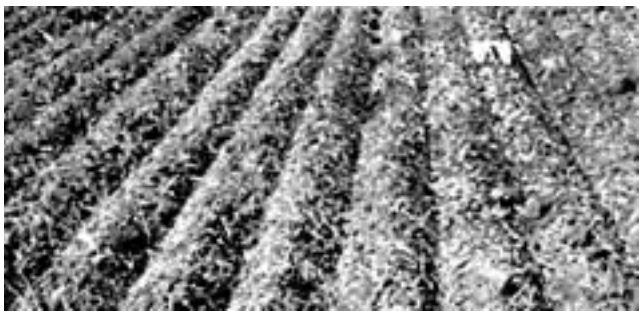


FIGURE 4. Soil Surface after Seeding Stubble.

Trash Clearance: Trash clearance was fairly good. Operation on fields that had extremely long trash resulted in the straw collecting

around the hoe shanks (FIGURE 5), causing occasional plugging.

FIGURE 5. Long Straw Collecting around Hoe Shanks.

Operation in Stony Fields: The spring cushioned shank performed well during the test and no problems occurred in stony conditions. The maximum lift height when openers encountered stones or field obstructions was 290 mm (11 in).

Plant Emergence: As with most drills, time and uniformity of plant emergence depended primarily upon seedbed preparation and soil moisture. FIGURE 6 illustrates good emergence in a summerfallow field seeded to durum wheat.

FIGURE 6. Durum Wheat Emergence on Summerfallow.

Metering Accuracy: The grain and fertilizer metering systems were calibrated in the laboratory[1] and compared with the manufacturer's calibration. Since actual rates for certain settings depend on things such as seed or fertilizer size, density and moisture content, it is not possible for a manufacturer to present chars to include all the varieties of seed and fertilizer used. Field calibration checks may be necessary for seed or fertilizer with properties differing from those indicated in the manufacturer's table. Research has, however, shown that small variations in seeding and fertilizing rates will not significantly affect grain crop yields.

Grain Metering System: Changing gear box settings (FIGURE 7) controlled the seed rate by changing feed wheel speed. Four different feed wheels for different sizes of grain were available. Calibration chars showed gear box settings for the different feed wheels in various grains. An optional slow speed drive assembly for rapeseed was also available.

Seeding rates, when compared to the calibration chart on the grain box lid, were 25% low when seeding 770 kg/m³ (60 lb/bu) Neepawa wheat, accurate when seeding 590 kg/m³ (46 lb/bu) Sioux oats, 7% high when seeding 690 kg/m³ (54 lb/bu) Betzes barley, and 6% high when seeding 680 kg/m³ (57 lb/bu) Tower rapeseed.

Level of grain in the grain box and field bounce had no effect on seeding rate. Travelling up a 15° slope caused a 10% decrease in seeding rate and travelling down a 15° slope caused an 8% increase. Seeding on a side slope caused a 5% decrease in seeding rate. Increasing forward speed from 5 to 11 km/h (3 to 7 mph) also caused a 5% decrease in seeding rate.

[1]*PAMI T773, "Detailed Test Procedures for Grain Drills".*

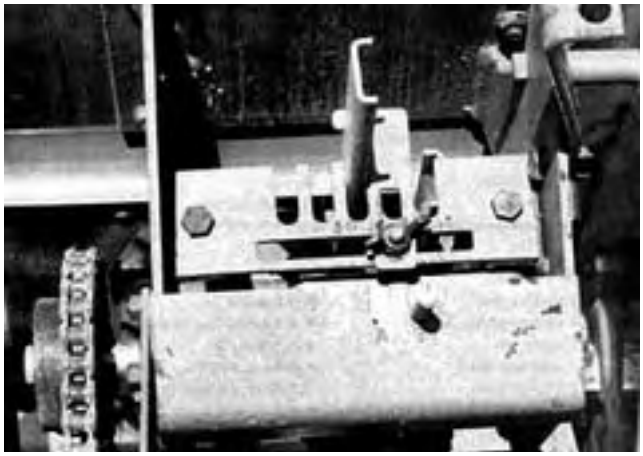


FIGURE 7. Gear Box for Setting Seed Rate.

The coefficient of variation (CV)[2] can be used to describe the variation of seeding rates among individual seed cups. An accepted variation for seeding grain or fertilizer is a CV value not greater than 15%. If the CV is less than 15%, seeding is uniform, whereas if the CV is greater than 15%, the variation among individual seed cups is excessive. The Melroe 282-147 was capable of uniform seeding, with CV's of 2 to 10% when seeding wheat, oats, barley and rapeseed.

Fertilizer Metering System: A gear box to change feed shaft drive speed, similar to that used to control seeding rate (FIGURE 7), was used to control the fertilizing rate. Fertilizing rate, when compared to the manufacturer's calibration chart, was about 7% low when applying 11-48-0 fertilizer with a density of 910 kg/m³ (57 lb/ft³).

Level of fertilizer in the fertilizer box and field vibration had no effect on fertilizing rates. Increasing forward speed from 5 to 11 km/h (3 to 7 mph) caused a 10% increase in application rate. Travelling up a 150 slope caused the rate to increase by 22% while travelling down slopes greater than 50 resulted in fertilizer flow stopping due to insufficient tube slope. Side slope had insignificant effect on fertilizing rate.

Fertilizer application across the width of the machine was not uniform, with CV's ranging from 14 to 17%.

Grass Seeding: A grass seeding attachment was available as optional equipment for the Melroe 282-147 but was not evaluated. Small seeds such as alfalfa could be seeded through the grain box using the fine feed wheels. Actual alfalfa seeding rates, when compared to the manufacturer's calibration were about 10% high when seeding 770 kg/m³ (60 lb/bu) Rambler alfalfa. A calibration chart for ryegrass was not given, but ryegrass could be seeded using the medium feed wheel. PAMI calibrations are shown in TABLE 2. Uniformity for both ryegrass and alfalfa were similar to that when seeding cereal grains. Large light seeds such as bromegrass bridged over the seed cups so they had to be seeded through the grain box by mixing the seed with heavier material such as grain.

TABLE 2. PAMI Calibration for Ryegrass

Medium Feed Wheels: 18 Tooth Gear on Drive Output 42 Tooth Gear on Feed Shaft	
Gear Box Lever Setting	**Rate (kg/ha)**
B5	6.5
A4	7.2
B4	8.2
A3	9.0
B3	10.2
A2	11.1
B2	12.7
A1	14.0
B1	15.2
Russian Wild Ryegrass Density = 270 kg/m³	

Acre Counter: The acre counter was accurate in most fields. The counter recorded the nearest tenth acre up to 100,000 acres. A metric counter was not available.

[2]*The coefficient of variation (CV) is the standard deviation of seeding rates from individual seed cups expressed as a percent of the mean seeding rate.*

EASE OF OPERATION

Hitching: The Melroe 282-147 was easy to hitch to a tractor. A hydraulic cylinder was not supplied. A standard 203 mm (8 in) stroke cylinder was suitable.

Filling: The grain and fertilizer boxes were conveniently filled from the 275 mm (11 in) wide walkway at the rear of the drill. The fertilizer and grain box lids both opened to 335 mm (13 in).

Cleaning: As with most drills, a vacuum cleaner or compressed air was needed for thorough cleaning of the grain and fertilizer boxes. Grain box parts were readily accessible for cleaning and the fertilizer box baffles above the feed shaft and the dropout panel below the feed shaft were easily removed.

Transporting: A maximum transporting speed was not recommended by the manufacturer. An acceptable maximum for grain drills equipped with press wheels is a speed of 16 km/h (10 mph). For multiple hook-ups and long transport distances the operator should consider using a drill transporter.

EASE OF ADJUSTMENT

Lubrication: Only one grease fitting required lubrication and it was readily accessible.

Seeding Rate: Seeding and fertilizing rates were conveniently set by adjusting the idler gear on the multiple speed gear boxes (FIGURE 7). Installing the low rate kit for rapeseed was also convenient. Changing feed wheels was time consuming, taking about 1 hour.

Depth Adjustment: Seeding depth was conveniently adjusted by positioning the hydraulic cylinder. Levelling the shanks for uniform depth was also convenient.

POWER REQUIREMENTS

Draft: Draft requirements depended on field preparation, soil and moisture. Average draft at 8 km/h (5 mph) with fully loaded seed and fertilizer boxes ranged from 6800 N (1500 lb) in fine sandy loam to 8000 N (1800 lb) in clay loam.

Tractor Size: Tractor size[3] needed to pull the 2.5 m (8.2 ft) section of Melroe 282-147 varied from a 27 kW (36 hp) power take off rating in fine sandy loam to 32 kW (43 hp) in clay loam.

OPERATOR SAFETY

The Melroe 282-147 was safe to operate if normal safety precautions were observed. The platform at the rear of the drill was large enough for safe filling of the grain and fertilizer boxes but care had to be exercised when standing on either end of the platform since the platform twisted. A bolt was provided to lock the hydraulic cylinder for transporting. No slow moving vehicle emblem was provided. It is recommended that the manufacturer consider providing a slow moving vehicle emblem.

OPERATOR'S MANUAL

The operator's manual contained useful information on adjustments, maintenance and operation. Calibration charts in both imperial and metric units were provided in the operator's manual and on the drill box. The calibration charts provided in the operator's manual did not agree with the charts provided on the grain drill, which created some confusion when attempting to calibrate the drill. It is recommended that the manufacturer consider changing the application charts in the operator's manual to agree more closely with the charts provided on the drill.

DURABILITY RESULTS

The Melroe 282-147 grain and fertilizer drill was operated for 62 hours while seeding about 104 ha (260 ac). The intent of the test was evaluation of functional performance and an extended durability evaluation was not conducted during functional testing.

TABLE 3. Mechanical History Item

Item	Operating Hours	Field Area ha
Opener Shank		
-The right outer shank broke at the weld and was rewelded at	24	40
Grain Tubes		
-The clip hole on the right outer grain tube wore and was repaired at	59	99
Press Wheels		
-A stripper mounting bracket was lost and replaced at	34	57
Fertilizer Attachment		
-Two plastic fertilizer drop tubes broke on removal at	beginning of test	

[3] *"PAMI Detailed Test Procedures for Cultivators".*

APPENDIX I
SPECIFICATIONS

MAKE:	Melroe Grain and Fertilizer Drill
MODEL:	282-147 Hoe Drill
SERIAL NO:	MB 13776

OVERALL DIMENSIONS:

-- height	1525 mm
-- length	4970 mm
-- width	2400 mm
-- effective seeding width	2489 mm
-- transport ground clearance	95 mm

SEED METERING SYSTEM:

-- type	externally fluted feed wheels
-- drive	chain and gear from press wheels
-- adjustment	multiple speed gear box controlling feed wheel speed
-- transfer to openers	coiled steel tubing

FERTILIZER METERING SYSTEM:

-- type	wire augers on round horizontal shaft
-- drive	chain and gear from press wheels
-- adjustment	multiple speed gear box controlling feed shaft speed
-- transfer to openers	plastic discharge tubes feeding into grain box drop tubes

OPENERS:

-- type	hoe
-- point	38 mm spear
-- number	14
-- spacing	178 mm
-- number of rows	3
-- distance between rows	500 mm
-- options	75, 125, or 150 mm shovels, acra plant or spear point openers, 178, 229, 254, or 305 mm spacing protection spring cushion

PRESS WHEELS:

-- type	V-shaped formed steel
-- diameter	515 mm
-- width	75 mm
-- number	14
-- spacing	178 mm
-- number of gangs	2
-- options	pneumatic wheel, semi-pneumatic, 50 mm round wheel, 75 mm V-wheel; 178, 229, 254, or 305 mm spacing

CASTOR WHEEL: 1, 6.70 x 15, 4-ply rib implement

GRAIN BOX CAPACITY: 388 L

FERTILIZER BOX CAPACITY: 0.24 m³

WEIGHT:	**Boxes Empty**	**Boxes Full**
-- press wheels	544 kg	847 kg
-- castor wheel	431 kg	860 kg
-- hitch	12 kg	12 kg
TOTAL	987 kg	1519 kg

NUMBER OF CHAIN DRIVES: 3

NUMBER OF LUBRICATION POINTS: 1

HYDRAULIC CYLINDER: 1, 65 x 203 mm (not supplied)

OPTIONAL ATTACHMENTS INCLUDED ON TEST MACHINE:
-- dry fertilizer attachment; double feed cup kit; fine, medium and intermediate feed wheels; low rate kit; acre meter; single hitch.

OTHER OPTIONAL ATTACHMENTS:
-- liquid fertilizer attachment, grass seeder, marker discs, multiple hitches, transport attachment, coarse feed wheels.

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

(a) excellent	(d) fair
(b) very good	(e) poor
(c) good	(f) unsatisfactory

APPENDIX III
CONVERSION TABLE

1 hectare (ha)	= 2.5 acres (ac)
1 kilometre/hour (km/h)	= 0.6 miles/hour (mph)
1 metre (m)	= 3.3 feet (ft)
1 millimetre (mm)	= 0.04 inches (in)
1 kilowatt (kW)	= 1.3 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds mass (lb)
1 newton (N)	= 0.2 pounds force (lb)
1 litre (L)	= 0.03 bushels (bu)
1 kilogram/hectare (kg/ha)	= 0.9 pounds/acre (lb/ac)
1 kilogram/cubic metre (kg/m³)	= 0.08 pounds/bushel (lb/bu)

ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html

Prairie Agricultural Machinery Institute
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:

P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080

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