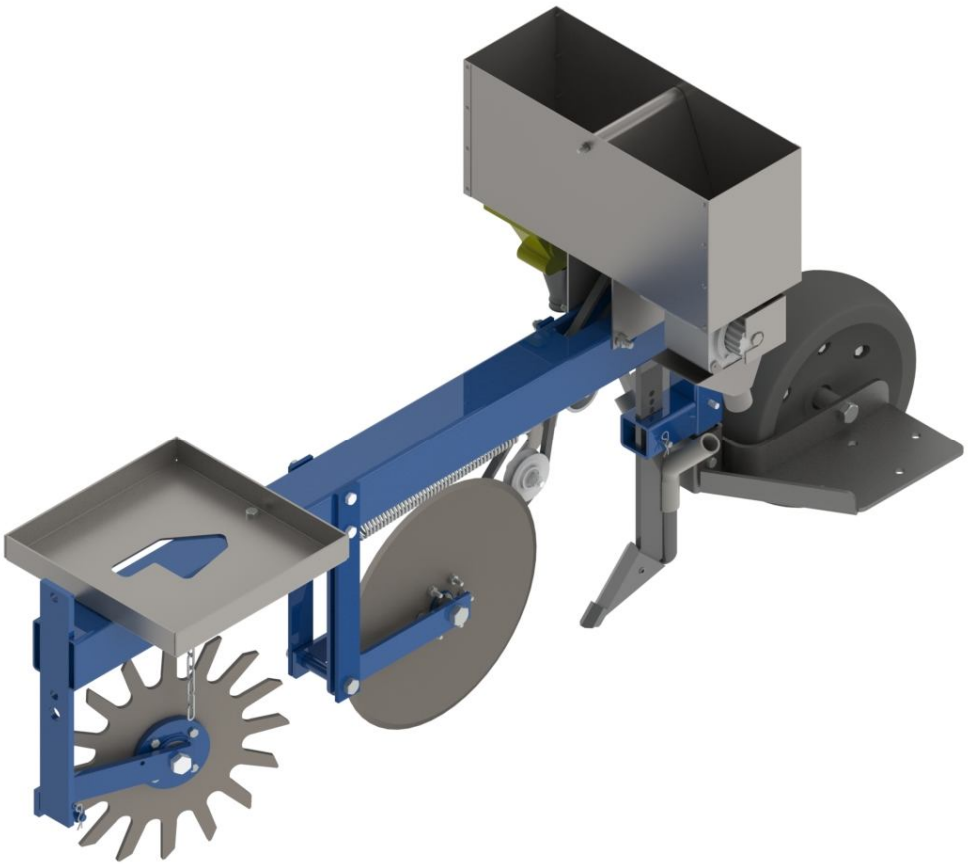
OWNER'S MANUAL

Morrison Seeders™

"Conservation Agriculture For Small Farms"

CA-Seeder 1000



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SAFETY

Safety messages and instructions located in this manual and on the seeder provide warnings to you and others of potential hazards. Before operating or servicing this seeder, it is important to read and understand these safety instructions and messages.

The safety alert symbol alerts you to potential hazards. The message that follows this symbol must be obeyed to avoid possible injury or death.

DANGER indicates the presence of immediate hazards which, if not avoided, could result in severe personal injury, death, or substantial property damage.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in severe personal injury, death or substantial property damage.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

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INTRODUCTION

The CA Seeder 1000 is a single row crop seeder designed for use in non-plowed "no-till" fields which are annually or biannually cropped, pulled by a 2-wheel tractor (2WT) or other suitable traction methods. The seeder is intended for row crops which are typically seeded in rows spaced 60 - 100 cm (24 – 40 in.).

Using a single pass, the seeder uses a 4-step process to provide consistent and trouble-free no-till row-crop seed planting:

1. Clear a narrow path through old-crop residues
2. Cut remaining residues in the path
3. Meter seed and low-rate non-toxic starter fertilizer into an opened soil slot
4. Press the slot closed.

It is not designed to be operated in the following conditions:

- ***fields covered with excessive amounts of crop residues from irrigated farming***
- ***sods or fields heavily covered by weeds or living plants***

The seeder attaches to the rear hitch of a 2WT using a hitch pin, which allows the seeder to follow curved paths and be easily turned at the end of rows. The seeder is forced into the soil by the weight of the operator standing at the rear of the seeder.

Seeder Features

- An adjustable rate, **dual-chamber seed meter** allows the planting of a wide range of seed types and sizes.

- An adjustable rate **fertilizer meter** allows starter granular fertilizer to be applied with the seed to enhance early plant growth.

- Triple-Purpose Fertilizer Application: The seeder may be used to apply:
    1) "Starter" fertilizer in the furrow as seeds are planted. It is important that these be applied at non-toxic rates.
    2) Fertilizer in pre-seeding "strip-tillage" furrows. Such furrows are done to clear and open paths through the field for rows that will be seeded later.
    3) "Side-dress" fertilizer beside planted furrows after crops have emerged. These are applied at much higher rates than for starter applications.

- A free-turning **residue rake wheel** with radial spikes moves old-crop residues from the seeder's path to reduce the work for the coulter disc.

- A sharpened, rolling **coulter disc** efficiently cuts any remaining residue in the seeder's path.
    - To maintain constant seeding depth, the coulter is spring-loaded to force it into the soil while allowing it to "float" over rocks and other obstacles and respond to differing soil hardness.
    - A v-belt pulley attached to the coulter drives the seed and fertilizer meters.

- A vertical **furrow-opener shank** with a replaceable narrow tool tip opens a perfect seed slot in a wide variety of soils using minimal traction. Planting depth is easily adjustable using a single pin.

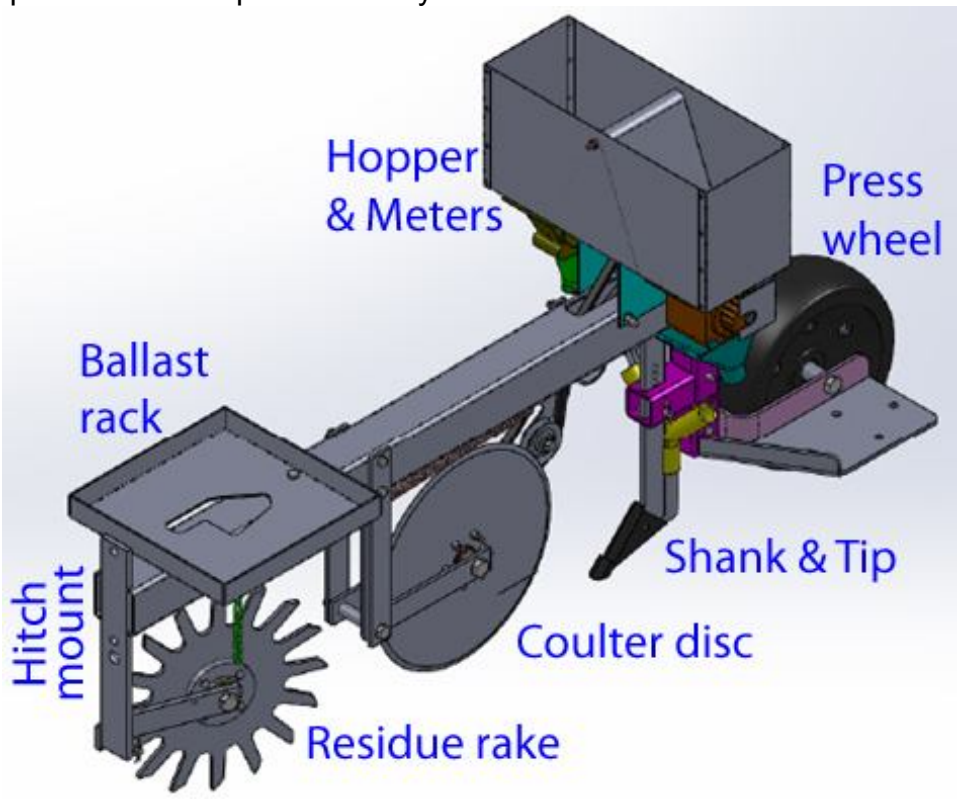
- An adjustable **presswheel-footpad assembly** firms the soil around the seed and allows the operator to comfortably ride on the seeder during planting as well as when traveling to the field. By simply moving a single pin, the presswheel can be moved from the planting position to the transport position.

- A large stainless steel **seed and fertilizer hopper** located in front of the operator provides easy visual indication of remaining seed/fertilizer.

- A **ballast rack** allows for counter balancing the weight of a front overhanging engine.

- A generic **hitch mounting plate** permits attachment of hitches for specific 2WT models using 2 high strength bolts.

- A one-piece **tubular "backbone" frame** ensures seeder strength and rigidity, while providing a convenient mounting location for all the functional parts:
    - hitch
    - ballast rack
    - residue rake
    - coulter disc
    - furrow-opener shank and tip
    - hopper-meter assembly
    - presswheel-footpad assembly



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DIMENSIONS AND WEIGHT

DIMENSIONS

	Metric	English
Length	160 cm	63 in
Height	86 cm	34 in
Width	43 cm	17 in

WEIGHT

Weight	50 kg	110 lbs

PREPARATION FOR PLANTING

HITCH TO 2-WHEEL TRACTOR (2WT)

Attach the seeder onto the rear hitch of a 2WT.

Asian 2WTs: Attach the seeder hitch with the hitch pin.

Italian 2WTs: Install Hitch Adapter Assembly (Italian) 2WT (PN 601053-000; sold separately) onto the 2WT. Attach the seeder hitch to the adapter assembly using the hitch pin.

WHEEL TRACTION

If the tractor wheels spin instead of pulling the rig forward, then more traction is needed. Methods of increasing traction include:

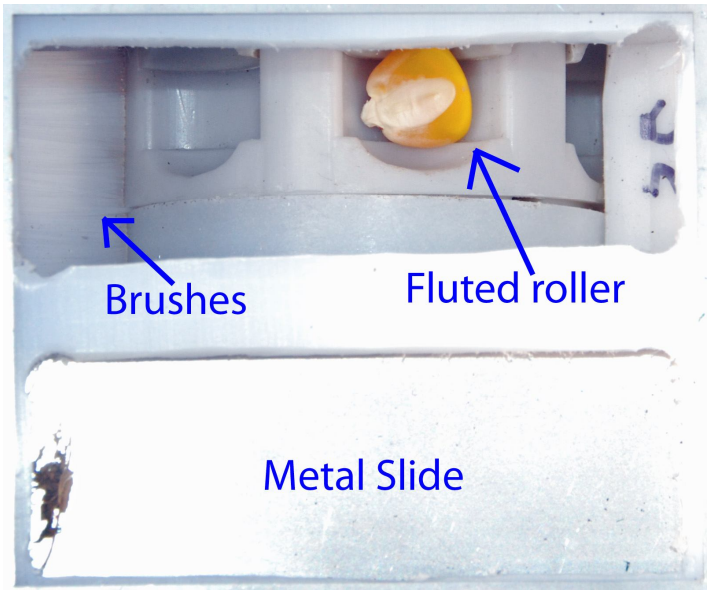
- Wheel weights, liquid or solid filling of tractor tires, or other ballast should be added to achieve the needed traction.
- Locking the differential drive may increase available traction on tractors equipped with this option.

TRACTOR BALANCE

After the seeder is hitched to the 2WT, the total assembly should be balanced to make it easy to raise the entire seeder off the ground for end of row turns.

- For light-weight 2WTs, additional ballast may be added onto the overhanging front of the tractor to balance the rear weight of the seeder. For Italian petro 2WTs, this might be approximately 45 kg (100 lbs).
- For heavy-weight diesel 2WTs (typical Asian 2WTs), additional ballast may be added to the ballast rack on the main frame of the seeder to compensate for the heavy engine weight overhanging the front of these tractors. This ballast may be as simple as a sack of soil.

SEED METER BRUSH ADJUSTMENT



Inside the seed meter are “seed cut-off” brushes. Their purpose is to limit the seeds that are metered out to only those that are in the recesses of the fluted roller. It is important that these brushes contact the roller surface.

To verify that the brushes are in contact:

1) Examine the brushes inside the meter by looking into the meter at the bottom of the hopper.

2) If the brushes are not in contact with the roller surface
    a. Loosen the nuts on the mounting bolts
    b. Adjusting the brushes against the roller.
    c. Retighten the bolts

METER CALIBRATION

Definitions:

a. **Recommended Rates:**

Seeding Population:	Number of seeds planted per hectare (or acre) measured in seeds/ha (or seeds/acre).
Seeding Rate:	Weight of seeds planted per hectare (or acre).
Fertilization Rate:	Weight of fertilizer applied per hectare (or acre).

b. **Calibration Targets:**

Seed count / 10 revolutions:	The number of seeds planted for every 10 revolutions of the Coulter disc.
Seed weight / 10 revolutions:	The weight of seeds planted for every 10 revolutions of the Coulter disc.
Fertilizer weight / 10 revolutions:	The weight of fertilizer applied for every 10 revolutions of the Coulter disc.

Calibration Procedure:

Calibration is based on the amount of seed and fertilizer dispensed during 10 revolutions of the rolling Coulter disc.

1) **Obtain seeding and fertilization rate recommendations from an agricultural extension advisor. Recommendations for larger seeds like maize are generally given in units of seeds/ha while recommendations for smaller seeds like wheat are given in kg/ha.**

   a. Recommended seeding population for the planned crop (for larger seeds).

   _____ Seeds/ha (or seeds/ac)

   b. Recommended seeding rate for the planned crop (for smaller seeds).

   _____ kg/ha (or lbs/ac)

   c. Recommended fertilization rate for the planned crop.

   _____ kg/ha (or lbs/ac)

2) **Decide what your row spacing will be. This is the distance between planted rows.**

_____ cm (or in)

3) **Determine distance traveled in 10 revolutions of the Coulter disc.**

a. Put a durable mark on one side of the Coulter Disc so that the number of disc revolutions can be easily counted.

b. Operate the seeder in the field and measure the distance traveled for 10 revolutions of the Coulter disc.

_____ m (or ft)

4) **Calculate planting meters per hectare (or feet per acre)**

This is a function of row spacing. The closer the rows, the more rows per hectare. The more rows, the more meters to be planted.

In this example a row spacing of 80 cm (31.5 in.) is used. To adjust the calculation for a different row spacing, replace 80 cm (or 31.5 in) in the formulas with the appropriate row spacing:

Metric:

a. **Row spacing in meters**: _____ (#2) cm / 100 cm/m = _____ (#4.a) m

Ex: 80 cm / 100 cm/m = 0.80 m

b. **Distance per hectare:** 10,000 m^2/ha / _____ (#4.a) m = _____ (#4.b) m/ha

Example: 10,000 m^2/ha / 0.80 = 12,500 m/ha

English:

c. **Row spacing in meters:** _____ (#2) in / 12 in/ft = _____ (#4.c) ft

Ex: 31.5 in / 12 in/ft = 2.625 ft

d. **Distance per hectare:** 43,560 ft^2/ac / _____ (#4.c) ft = _____ (#4.d) ft/ac

Example: 43,560 ft^2/ac / 2.625 = 16,600 ft/ac

5) Calculate calibration targets

a. Seeds/10 revolutions:

Metric:

i. _____ (#1.a) seeds/ha / _____ (#4.b) m/ha = _____ (#5.a.i) seeds/m

ii. _____ (#5.a.i) seeds/m * _____ (#3) m/10 rev. = _____ (#5.a.ii) seeds/10 rev.

Example: 625,000 seeds/ha / 12,500 m/ha = 50 seeds/10 rev.

English:

i. _____ (#1.a) seeds/ac / _____ (#4.d) ft/ac = _____ (#5.a.iii) seeds/ft

ii. _____ (#5.a.iii) seeds/ft * _____ (#3) ft/10 rev. = _____ (#5.a.iv) seeds/10 rev.

Example: 830,000 seeds/ac / 16,600 ft/ac = 50 seeds/10 rev.

b. Weight of seed/10 revolutions

Metric:

i. _____ (#1.b) kg/ha * 1000 g/kg = _____ (#5.b.i) g/ha

ii. _____ (#5.b.i) g/ha / _____ (#4.b) m/ha = _____ (#5.b.ii) g/m

iii. _____ (#5.b.ii) seeds/m * _____ (#3) m/10 rev. = _____ (#5.b.iii) g/10 rev.

Example: ((100 kg/ha * 1000 g/kg) / 12,500 m/ha) * 10 m/10 rev = 80 g/10 rev

English:

i. _____ (#1.b) lbs/ac * 16 oz/lb = _____ (#5.b.iv) oz/ac

ii. _____ (#5.b.iv) oz/ac / _____ (#4.d) ft/ac = _____ (#5.b.v) oz/ft

iii. _____ (#5.b.v) oz/ft * _____ (#3) ft/10 rev. = _____ (#5.b.vi) oz/10 rev.

Example: ((86 lb/ac * 16 oz/lb) / 16,600 ft/ac) * 33 ft/10 rev = 2.74 oz/10 rev

c. Weight of fertilizer /10 revolutions

Metric:

i. _____ (#1.c) kg/ha * 1000 g/kg = _____ (#5.c.i) g/ha

ii. _____ (#5.c.i) g/ha / _____ (#4.b) m/ha = _____ (#5.c.ii) g/m

iii. _____ (#5.c.ii) seeds/m * _____ (#3) m/10 rev. = _____ (#5.c.iii) g/10 rev.

Example: ((112 kg/ha * 1000 g/kg) / 12,500 m/ha) * 10 m/10 rev = 90 g/10 rev

English:

i. _____ (#1.c) lbs/ac * 16 oz/lb = _____ (#5.c.iv) oz/ac

ii. _____ (#5.c.iv) oz/ac / _____ (#4.d) ft/ac = _____ (#5.c.v) oz/ft

iii. _____ (#5.c.v) oz/ft * _____ (#3) ft/10 rev. = _____ (#5.c.vi) oz/10 rev.

Example: ((100 lb/ac * 16 oz/lb) / 16,600 ft/ac) * 33 ft/10 rev = 3.18 oz/10 rev

6) Amount of seeds released in 10 revolutions of the Coulter disc.

a. Expose either the large or small flute cavities in the Seed Meter by inserting the metal slide cover on the side of the Seed Meter you do NOT wish to use.

NOTE: For typically flat maize seed, the large flute cavities are used and the Seed Meter should be adjusted so that the seed will lie flat in the cavities (not on edge). For smaller seeds, use the small cavities.

b. Place a block under the Shank Tip to elevate the seeder so the Coulter Disc can turn freely.
c. Place a catch-pan under the shank drop tube.
d. Wearing sturdy gloves, carefully turn the Coulter Disc 10 revolutions (turn smoothly).

The sharp Coulter Disc and other metal edges may be harmful when contacted during manual turning of the Coulter Disc. Hands should always be protected by wearing appropriate protective gloves when manually turning the disc.

e. Count or weigh the seeds collected in the catch-pan.

7) **Conduct multiple trials to achieve the target seeding rate.**

   a. Adjust seeding rate:
      i. Loosen the adjustor knob.
      ii. Shift the Seed Rate Adjustor Bracket sideways. Move it by pushing the adjustor bracket and NOT by pushing the knob.
      iii. Tighten the knob.
   b. Repeat steps 2 and 3 above until the target seeding rate is achieved.
   c. Record your calibration results. Note the number under the pointer on the Seed Rate Adjustor Bracket for future reference.

8) **Amount of fertilizer released in 10 revolutions of the Coulter disc**

   a. Place a block under the Shank Tip to elevate the seeder so the Coulter Disc can turn freely.
   b. Place a catch-pan under the shank drop tube.
   c. Wearing sturdy gloves, carefully turn the Coulter Disc 10 revolutions (turn smoothly)

⚠CAUTION **The sharp Coulter Disc and other metal edges may be harmful when contacted during manual turning of the Coulter Disc, so hands should be protected by wearing appropriate protective gloves when conducting #6, above.**

   d. Weigh the fertilizer collected in the catch-pan.

9) **Conduct multiple trials to determine what position is appropriate to achieve the target fertilizer rate.**

   a. Adjust fertilization rate:
      i. Loosen the adjustor knob.
      ii. Shift the Fertilization Rate Adjustor Bracket along the drive shaft. Move it by pushing the adjustor bracket and NOT by pushing the knob.
      iii. Tighten the knob.
   b. Repeat steps 9 to 11above until the target fertilizer application rate is achieved.
   c. Record your calibration results. Note the number opposite the pointer under the adjustor knob for future reference.

PLANTING INSTRUCTIONS

After the calibration of seeding rate and fertilizer application rate, the seeder is ready for transport to the field and use.

LOCAL TRANSPORTATION

For local transport, raise the Seeder into the transport position by adjusting the attachment strut on the Rear Presswheel. For driven transport, the operator should stand on the foot pads and then engage the forward-motion apparatus on the attached 2WT.

If the 2WT is NOT equipped with brakes, then the transport speed should be limited to very slow, controllable speeds, whereby the operator can step off from the foot pads and manually stop the machine motion.

If the assembled 2WT and Seeder are to be operated on a public road or highway in the transport mode, then appropriate lighting, safety flags, escort vehicles, and/or other safety precautions should be used at all times.

FIELD USE OF CA-SEEDER

Field Condition: The condition of the field is very important for the successful use of the CA-Seeder 1000 and for successful CA cropping. Field conditioning procedures are beyond the scope of this Owner's Manual, but it is very important to have any and all vegetation in the field killed prior to the seeding operation. Tall, coarse stalks from previous crops should NOT be cut and randomly laid across the intended path of the Seeder. Such tall, coarse stalks are better left standing for the Seeder to successfully pass through the field without blockages.

In general, the recommended field seeding procedure is to operate the Seeder near old crop rows or in the middles between old crop rows. If tall, coarse stalks have been felled during the prior harvest, then the seeder should be operated in the direction of the felled stalks to minimize blockages.

Avoiding Seed-Tube Blockages: As for most mechanized seeding machines, never operate the Seeder in reverse motion when the Shank Tip is in the soil This is to avoid blockages of the seeding tube on the rear of the Shank.

Before stepping onto the Foot Pads, it is important to start slow forward motion of the Seeder. This allows the Shank Tip to ease down into the soil without blocking the seeding tube. If you force the Shank straight down into the soil without opening up a furrow it may block the seeding tube with soil.

Seeding Across the Field with the 2WT and Seeder Assembly:

A) Initial Seeding: When first starting to use the Seeder:

a. Check seeding depth
   i. Start seeding a crop row along one edge of a field or following the row pattern of a previous crop.
   ii. Seed only for a short distance of several meters and stop.
   iii. Examine the seeding depth. In non-plowed soils, the suggested seeding depth is usually
      1. 3-4 cm for large seed such as maize
      2. 2-2.5 cm for beans and many small-seeded crops
   iv. Adjust the shank if the seeding depth seems to be out of the desirable range.
   v. Continue seeding. Stop frequently to check the seeding depth and rate until you are satisfied that it is running as desired.

b. Check Residue Rake Wheel performance.

   Adjust the height of the Residue Rake Wheel using the S-hook on the chain as needed for path clearing.

B) Turning at the End of the Row:

a. Slow the speed of the 2WT near the end of the crop row.
b. At the end of the row, step off from the Foot Pads.
c. Use the 2WT handlebars to lift the Seeder out of the soil.
d. Stop powered forward motion of the 2WT.
   i. If the 2WT has differential gearing and/or individual steering brakes, powered forward motion may be used while holding the Seeder off the ground for the turn.
e. Turn the tractor around while holding the Seeder off the ground until the tractor and Seeder are positioned to seed a new row parallel to the previous row.

When turning the seeder while it is being held in a raised position with the 2WT handlebars, and especially at the end of the field rows, the operator must be very careful to avoid contacting the raised rear of the Seeder and especially the Foot Pads to avoid personal injury.

C) Allow adequate room at the end of the seeded rows for turning the 2WT and attached Seeder. Traditionally, these “head lands” are seeded first before the main crop rows are seeded, so that all of the field is utilized for cropping.

If the field is sloping or located on significant hilly terrain, then extra caution must be exercised by the operator to ensure that the 2WT and attached Seeder can be safely maneuvered in the field and especially when turning at the ends of seeded rows.

D) The width and uniformity of crop row spacing depends on the skill of the operator who may use various techniques to guide the 2WT:

   a. Follow old crop row patterns.
   b. Run the tractor tires in the same path as the tread on the previous row.
   c. Use markers, guides, or other guidance device.

E) If the surface residues are extremely heavy, they might collect and build up on the residue rake or furrow-opener shank. When this happens, stop the 2WT and remove the debris before starting up again.

Estimated Work-Rate

The time required to plant a hectare of land depends upon the row-spacing and the speed at which the seeder is operated. 60% field efficiency is assumed to reflect time required for stops, turns, refilling the hoppers, etc.

Hours / Hectare by Seeder Speed and Row-Spacing

		Row-Spacing		
		60 cm	**80 cm**	**1 m**
Seeder Speed	3 km/hr	9 hrs 16 min	6 hrs 57 min	5 hrs 33 min
	4 km/hr	6 hrs 57 min	5 hrs 13 min	4 hrs 10 min
	5 km/hr	5 hrs 47 min	4 hrs 20 min	3 hrs 28 min

CALCULATION WORKSHEET - METRIC

1.a Recommended seeding population for the planned crop: _____ seeds/ha

1.b Recommended seeding rate for the planned crop: _____ kg/ha

1.c Recommended fertilization rate for the planned crop: _____ kg/ha

2 Row spacing: _____ cm

3 Distance traveled in 10 revolutions of the Coulter disc: _____ m

4 Calculate planting meters per hectare

4.a Row spacing in meters: _____ (#2) cm / 100 cm/m = _____ (#4.a) m

4.b Distance per hectare: 10,000 m^2/ha / _____ (#4.a) m = _____ (#4.b) m/ha

5.a Seeds/10 revolutions calibration target:

i. _____ (#1.a) seeds/ha / _____ (#4.b) m/ha = _____ (#5.a.i) seeds/m

ii. _____ (#5.a.i) seeds/m * _____ (#3) m/10 rev. = _____ (#5.a.ii) seeds/10 rev.

5.b Weight of seed/10 revolutions calibration target:

i. _____ (#1.b) kg/ha * 1000 g/kg = _____ (#5.b.i) g/ha

ii. _____ (#5.b.i) g/ha / _____ (#4.b) m/ha = _____ (#5.b.ii) g/m

iii. _____ (#5.b.ii) seeds/m * _____ (#3) m/10 rev. = _____ (#5.b.iii) g/10 rev.

5.c Weight of fertilizer /10 revolutions calibration target:

i. _____ (#1.c) kg/ha * 1000 g/kg = _____ (#5.c.i) g/ha

ii. _____ (#5.c.i) g/ha / _____ (#4.b) m/ha =_____ (#5.c.ii) g/m

iii. _____ (#5.c.ii) seeds/m * _____ (#3) m/10 rev. = _____ (#5.c.iii) g/10 rev.

CALCULATION WORKSHEET - ENGLISH

1.a Recommended seeding population for the planned crop: _____ seeds/ac

1.b Recommended seeding rate for the planned crop: _____ lb/ac

1.c Recommended fertilization rate for the planned crop: _____ lb/ac

2 Row spacing: _____ in

3 Distance traveled in 10 revolutions of the Coulter disc: _____ ft

4 Calculate planting meters per hectare

4.a Row spacing in meters: _____ (#2) in / 12 in/ft = _____ (#4.a) ft

4.b Distance per hectare: 43,560 ft^2/ac / _____ (#4.a) ft = _____ (#4.b) ft/ac

5.a Seeds/10 revolutions calibration target:

i. _____ (#1.a) seeds/ac / _____ (#4.b) ft/ac = _____ (#5.a.i) seeds/ft

ii. _____ (#5.a.i) seeds/ft * _____ (#3) ft/10 rev. = _____ (#5.a.ii) seeds/10 rev.

5.b Weight of seed/10 revolutions calibration target:

i. _____ (#1.b) lbs/ac * 16 oz/lb = _____ (#5.b.i) oz/ac

ii. _____ (#5.b.i) oz/ac / _____ (#4.d) ft/ac = _____ (#5.b.ii) oz/ft

iii. _____ (#5.b.ii) oz/ft * _____ (#3) ft/10 rev. = _____ (#5.b.iii) oz/10 rev.

5.c Weight of fertilizer /10 revolutions calibration target:

i. _____ (#1.c) lbs/ac * 16 oz/lb = _____ (#5.c.i) oz/ac

ii. _____ (#5.c.i) oz/ac / _____ (#4.d) ft/ac = _____ (#5.c.ii) oz/ft

iii. _____ (#5.c.ii) oz/ft * _____ (#3) ft/10 rev. = _____ (#5.c.iii) oz/10 rev.

CARE & MAINTENANCE

CARE OF CA-SEEDER 1000 AFTER EVERY SEEDING SESSION

The Seeder should be cleaned of all soil and debris after every seeding operation and emptied of fertilizer at the end of every day.

Empty the seed hopper:

1) Place a block under the Shank Tip to elevate the seeder so the Coulter Disc can turn freely.
2) Place a catch-pan under the drop tube behind the shank tip.
3) Open the Seed Rate Adjustor to maximum rate
4) Wearing sturdy gloves, carefully turn the Coulter Disc 10 revolutions (turn smoothly)

The sharp Coulter Disc and other metal edges may be harmful when contacted during manual turning of the Coulter Disc. Protect hands by wearing appropriate protective gloves.

Empty the fertilizer hopper:

1) Place a block under the Shank Tip to elevate the seeder so the Coulter Disc can turn freely.
2) Place a catch-pan under the drop tube behind the shank tip.
3) Remove the fertilizer meter clean-out lock wire to allow the clean-out flap to drop down
4) Wearing sturdy gloves, carefully turn the Coulter Disc 10 revolutions (turn smoothly)

The sharp Coulter Disc and other metal edges may be harmful when contacted during manual turning of the Coulter Disc. Protect hands by wearing appropriate protective gloves.

5) Catch the fertilizer in the catch-pan

NOTE: This should be done at the end of each day when seeding to avoid corrosion of the metal parts and overnight caking of the fertilizers.

Cleaning:

1) Clean all parts of the seeder that touch the soil
2) Rub those parts with oil to prevent rust

Storage:

Store the seeder indoors to protect it from the sun and rain.

TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE	CHECKS & REMEDIES
Seeder and 2WT tip forward when handlebars are released	Overhanging front engine on 2WT is heavier than the Seeder	Place some ballast weight in the Ballast Rack on the Seeder; a bag of soil, rocks, iron, or other ballast can be used.
Seeder is too heavy to conveniently lift with the handlebars of the 2WT	Seeder is heavier than the overhanging front engine on the 2WT	Attach ballast weights to the front of the 2WT so that the Seeder is easily lifted by the handlebars.
2WT wheels slip or spin when the seeder is operating in the soil	Soil may be too wet for wheel traction	Delay seeding operation until field soil is dry enough for wheel traction.
	Additional weight is needed on the 2WT for adequate wheel traction	Add weight to the 2WT: by filling the tires with a liquid or with solid rubber; by adding ballast weight to the 2WT wheels with wheel weights; by adding ballast weight to the frame of the 2WT.
	Differential-lock on 2WT is not engaged	Engage differential-lock when seeding; disengage when turning at the end of the field.
Seeder impacts rocks in the field soil	Rocks are buried in the soil	Slow the seeding speed to reduce the impact of the Seeder on buried rocks.
Residue Rake Wheel does not clear a path for the Seeder	Rake Wheel is adjusted too high off the ground	Lower the Rake Wheel by adjusting the chain length.
Residue Rake Wheel digs too deeply into the soil	Rake Wheel is adjusted too low allowing it to dig into the soil	Raise the Rake Wheel by adjusting the chain length.
Rolling Coulter Disc does not freely rise and fall	Pivot for the Coulter Disc may need to be serviced	Adjust locking-nut on pivot bolt to allow free movement.
		Release the heavy spring on the Coulter assembly and remove and grease the pivot bolt, reinstalling all parts.
Rolling Coulter Disc does not cut deep enough into the soil	Soil is too dry and/or hard for disc penetration	This is not a problem, if the residues are being cut and if the Shank Tip is penetrating deep enough into the soil for seeding.
	Coulter Disc is worn to a small diameter.	Replace Coulter Disc with a new part.
Soil accumulates on the R.H. side of the Coulter Disc and in the V-belt drive pulley on the Disc Hub.	Scraper is missing or not properly adjusted to scrape soil off from the R.H. side of the Coulter Disc.	Adjust or replace the Scraper to be in full contact with the side of the Disc.

SYMPTOM	POSSIBLE CAUSE	CHECKS & REMEDIES
Shank Tip does not penetrate into the soil	End of the Tip may be worn into a rounded shape by soil abrasion	Restore the original shape of the Tip by adding weld-metal
		Replace the Tip with a new part.
		For abrasive soils, use a Tip with a harden carbide cutting end.
Seed Tube on the Shank becomes blocked with soil	Seeder is being forced into the soil when not moving forward.	Never operate the 2WT in the reverse direction when the Seeder is in the soil
		Start the forward direction of the Seeder before stepping onto the Footpads, forcing the shank and seed tube assembly into the soil.
Thick layer of soil accumulates on the Presswheel	Soil is too wet to operate Seeder	Delay seeding operation until soil is dry enough to operate without excessive soil accumulation on the Presswheel.
		If this is only a local situation in a field, then the operator should partially step off from the Footpads to reduce Seeder sinkage and soil accumulation on the Presswheel.
Seeder sinks into very loose and soft soil.	Soil is too soft to support the weight of the operator on the Footpads	Reposition the Presswheel shaft by removing the clevis pin and moving it into the next attachment hole.
Drive V-belt slips causing non-continuous metering.	Seed and fertilizer meters do not freely turn	Release the Belt Tightener spring and turn the Drive Shaft for the meters to determine if they do not rotate freely.
		Replace Drive Shaft Bearings if they do not turn freely.
		Inspect Seed Meter and Fertilizer Meter to determine the cause of any non-free rotation.
	V-belt is worn.	Replace V-belt.
	Fertilizer materials are caked in fertilizer Meter.	Remove bottom-flap retaining wire on Fertilizer Meter and completely clean Meter of blockages.
Seed metering is producing some “skips”, in seeded rows.	Some flutes in the Seed Meter rotor may not be filled with seed.	Adjust seed-rate calibration to a slightly higher seeding rate to allow some double-drop metering as an alternative to having unfilled “skips”.
		Slow seeding field speed to allow for more uniform seed metering.
Extra seed are passing between the Seed Meter rotor and the Cutoff Brush.	The Cutoff Brush is out of adjustment or worn.	If out of adjustment, loosen the retaining bolts and reposition the brush against the rotor.
		If misshaped or worn, replace the Cutoff brush.

SERVICE PARTS LIST

Assembly Number	Assembly Name	PART NUMBER	DESCRIPTION	USE ON MODEL
1	Residue Rake	801015-000	Residue Rake Wheel	CA-1000
		871014-000	Bearing, Residue Rake Wheel Hub	CA-1000
		Call	Residue Rake Hub with Bearing	CA-1000
2	Coulter Disc	801014-000	Coulter Disc, 13.5" x 3mm	CA-1000
		871013-000	Bearing, Colter Disk Hub-Pulley	CA-1000
		Call	Coulter Disc Hub-Pulley with Bearing	CA-1000
		702094-001	Coulter Disc Scraper	CA-1000
		801018-000	Coulter Disc Spring, 8½"	CA-1000
		851013-002	V-Belt	CA-1000
3	Belt Tensioner	851015-000	V-Belt Idler Pulley	CA-1000
		851014-000	Flat Idler Pulley	CA-1000
		801017-000	Spring, 6"	CA-1000
4	Shank & Point	601038-000	Shank Assy w/o Point	CA-1000
		801011-000	Point, w/o Hardened Tip	CA-1000
		801012-000	Point, with Hardened Tip	CA-1000
5	Presswheel	801016-000	Presswheel with Bearing, 4"x12"x⅝"	CA-1000
6	Meters	801006-001	Seed Meter, 6x19, Hex Shaft	CA-1000
		801007-001	Fertilizer Meter, Keyed Shaft	CA-1000
		702081-000	Seed Meter Slide	CA-1000
		801009-000	Funnel, Seed Meter	CA-1000
		801010-000	Funnel, Fertilizer Meter	CA-1000
		702106-000	Seed Tube, 10"	CA-1000
		821022-001	Knob, Meter Adjustment	CA-1000
		702103-001	Seed Meter Drive Shaft	CA-1000
		702102-001	Fertilizer Meter Drive Shaft	CA-1000
		871015-000	Drive Shaft Bearing	CA-1000
		851012-000	Drive Shaft Lock Collars	CA-1000
	Hitch	601053-000	Hitch Adapter Assy, Italian 2WT	CA-1000

CA-SEEDER 1000 --- SEEDING-RATE CALIBRATION CHART

"Machine Setting" is the number under the pointer on the Seeder for the selected flute exposure.

Seed	Seed Size	# Flute Cells (4, 5, 6 or 19)	Machine Setting	Seed Spacing (ft or cm)	Row Spacing (cm)	Target Population		Calibration (seed/10 REV) (g / 10 REV.)
						Plants / ha	Plants / acre	
(Example)	**XXXX**	**X**	**XX**	**21.1**	**80**	**59,305**	**24,000**	**51**
Hybrid Maize	Small Flats							
Hybrid Maize	Medium Flats							
Hybrid Maize	Large Flats							
Hybrid Maize	Small Rounds							
Hybrid Maize	Medium Rounds							
Hybrid Maize	Large Rounds							
Landrace Maize								
Beans / Frijoles								
Soya / Soybeans								
Sunflower								

CA-SEEDER 1000 --- FERTILIZER-RATE CALIBRATION CHART

"Machine Setting" is the number under the pointer on the Seeder for the selected flute exposure.

Fertilizer	Machine Setting	Row Spacing (cm)	Target Fertilization-Rate			Calibration (gm / 10 REV.)
			kg/ha	lb/acre	kg/acre	
Example(18-46-0)	**00085**	**80**	**16.8**	**15**	**6.8**	**80**

CA-SEEDER 1000 - CONTACT INFORMATION

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Within The United States & Canada

TBD

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