AGROWPLOW®

Soil Care Systems International Pty Ltd A.C.N. 075 828 947 Inc in NSW

Operator's Manual & Parts Listings

AD95 SERIES AGROWDRILL

Prosperity through Soil Care

AD95 SERIES
AGROWDRILL

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Company Profile

Soil Care Systems International Pty Ltd trading as AGROWPLOW is an innovative, soil conscious, wholly Australian owned company, committed to developing "Soil Care" products for improved, sustainable agriculture.

Over many years, farming has exploited Australian soils - degrading soils and depleting yields.

The founders of Agrowplow had the foresight to see that farmers needed to improve their practices - to improve soil structure, increase humus and allow more water to infiltrate and store in the soil - if farming was to be sustainable.

The first Agrowplow was designed and built in 1977 to improve soil structure, increase humus levels and increase water infiltration and storage deep into the soil.

Today, the company's range of Agrowplows and Agrowdrills are widely accepted by Australian farmers and agricultural researchers for their unique capabilities. The term "Agrowplow" has become a "farming concept" rather than just another implement.

The company's range of specialised Agrowplows, Agrowdrills and other products are designed and manufactured under strict code of sustainable agricultural mechanisation, and promoted under the slogan - "Prosperity through soil care".

Traditional cultivating practices were all aimed at controlling weed growth and preparing a fine "seed-bed". Unfortunately these practices destroy soil humus, expose soil particles to erosion, compact the soil, restrict moisture penetration, reduce root growth and plant yields.

The "Soil Care Systems " of farming is different because it promotes the health of both "seed-bed" and "rootbed" in a sustainable way - working with nature rather than against it.

It has a national dealer network throughout Australia, with overseas representation in New Zealand and the USA.

Quality standards ISO9001 have been accredited to the company since 1995 with endorsed Licence No. QEC 6087. Procedures and processes are constantly being upgraded to improve customer service and product quality.

The company's research and development division develops world leading technology for Agrowplow has a well earned reputation of turning market "Ideas" into reality.

The research and development team also develop ideas through conceptual design and prototype development, right up to preproduction if required (including production drawings) for outside clientele.Full confidentiality and non-disclosure policy and documentation protect customer ideas.

Development is undertaken with the professional guidance of fully qualified design engineers and draughtsmen, with the use of CADCAM which supports the complete design to manufacture process. All designs are manufactured to the highest standards of quality control.

Recent examples of design work include:

- A tree transplanter for landcare and landscaping.
- Sludge injection machines for direct injection of biosolids ie. food waste, sewerage sludge, etc.
- Fertiliser boxes for ploughs.
- Loose Ring Flexi-Rollers.
- Experimental seeding and harvesting equipment.
- Mining conveyor systems.

Agrowplow has large factory area (3387 square metres) with extensive fabrication equipment including computer controlled robot mig welding facilities. Experienced and qualified personnel form an extensive resource in all areas.

Agrowplow - building soil care products for improved, sustainable agriculture.

Below: Sludge injection machine developed for direct injection of biosolids.

AGROWDRILL PRE DELIVERY CHECKLIST

AGROWPLOW **Soil Care** Systems International Pty Ltd
134 Thornton Street, Wellington NSW 2820; P O Box 270, Wellington NSW 2820
Phone: (ISD 612)(STD 02) 6845 1566
Fax: (ISD 612) (STD 02) 6845 1603
Email: agrow@well-com.net.au

Note: This form **must be completed** and then **signed by both the Dealer and the Customer.**

The top copy **must be returned to Agrowplow within 7 days** of installation.

1.0 - HOPPER

OK ☐ NO ☐ 1.1 Full Set of Blanking Off Caps in Seed Compartment.
OK ☐ NO ☐ 1.2 Full Set of Blanking Off Caps in Fertilizer Compartment.
OK ☐ NO ☐ 1.3 Check the Blanking Off Cap locating strips are adjusted firmly against Blanking Off Cap supporting legs.
OK ☐ NO ☐ 1.4 Check Nuts are tight on the Gas Struts.
OK ☐ NO ☐ 1.5 Check Quadrant Handle is secured to Hex Shaft.
OK ☐ NO ☐ 1.6 Check there is Zero gap between Gate and Roller when Adjustment Lever is fully at setting one.
OK ☐ NO ☐ 1.7 Check the Hopper to Frame mounting bolts are tight.
OK ☐ NO ☐ 1.8 Check that the Hopper is clean of any debris.

2.0 - WHEEL ASSEMBLIES

OK ☐ NO ☐ 2.1 Check Wheel Nuts are all present and fully tightened.
OK ☐ NO ☐ 2.2 Check Tyre Pressures are correct (See page 41 for pressures).
OK ☐ NO ☐ 2.3 Tighten all nuts on bearing housings - 8 nuts on each side.
OK ☐ NO ☐ 2.4 Grease Wheel Bearings - 2 per assembly.
OK ☐ NO ☐ 2.5 Check & Tighten all bolts attaching the Wheel Carrier Beams to the Frame
OK ☐ NO ☐ 2.6 Check and Grease Adjustable Depth Collars.
OK ☐ NO ☐ 2.7 Check that both Wheels are adjusted to the same depth.
OK ☐ NO ☐ 2.8 Check that Ram Location Pins are secure.

3.0 - DRIVE

OK ☐ NO ☐ 3.1 Check seating & tighten Main Drive Sprocket on Wheel axle.
OK ☐ NO ☐ 3.2 Make sure all sprockets are fully aligned.
OK ☐ NO ☐ 3.3 Check chain tensions - deflection 5mm - 8mm with hand pressure.
OK ☐ NO ☐ 3.4 Check maximum of 6mm shims on the lay shaft.
OK ☐ NO ☐ 3.5 Ensure Lay Shaft Sprocket Grub Screws are positioned in the keyway.
OK ☐ NO ☐ 3.6 Check that Chain Guards are secure.
OK ☐ NO ☐ 3.7 Check that Varibox Sprockets are secure.
OK ☐ NO ☐ 3.8 Check that Varibox is filled to correct level with motor oil.
OK ☐ NO ☐ 3.9 Check for oil leaks.
OK ☐ NO ☐ 3.10 Check that Varibox mounting bolts are secure.
OK ☐ NO ☐ 3.11 Check that Rate Adjusting Levers run freely in the slots.
OK ☐ NO ☐ 3.12 Check that Levers are seated and securely fastened to shafts.
OK ☐ NO ☐ 3.13 Check that Levers move to Zero on the Quadrant scale.
OK ☐ NO ☐ 3.14 Check that a Friction Rubber/Nylon Washer is placed under hand nut.

4.0 - UNDER CARRIAGE

OK ☐ NO ☐ 4.1 Check that all tines aligned correctly.
OK ☐ NO ☐ 4.2 Check that Tines are evenly spaced.
OK ☐ NO ☐ 4.3 Check that Tine clamps are firmly tensioned.
OK ☐ NO ☐ 4.4 Check that Tines Split Pins are in position.
OK ☐ NO ☐ 4.5 Check that all tines are perpendicular to the toolbar.
OK ☐ NO ☐ 4.6 Check Opener & Sowing Tube orientation are correctly aligned with tines.
OK ☐ NO ☐ 4.7 Owner/Operator advised to re-tension main tine clamps after
OK ☐ NO ☐ 30 minutes of operation.
OK ☐ NO ☐ 4.8 Check that all Soil Openers align with coulters when fitted.
OK ☐ NO ☐ 4.9 Check tension of all coulter bolts when fitted.
OK ☐ NO ☐ 4.10 Check Coulters are vertical and square to carrier when fitted.

5.0 - HYDRAULICS & FRAME ASSEMBLIES

OK ☐ NO ☐ 5.1 Pressure Test All Connections for leaks.
OK ☐ NO ☐ 5.2 Operator advised that the flow divider valve requires a minimum of 16 l/minute flow rate and clean oil to operate correctly.
OK ☐ NO ☐ 5.3 Check that the Levelling Tube is greased & free to rotate when unlocked.

DECLARATION

1 I, the Authorised Agrowplow Dealer, have serviced Agrowdrill Serial No..... and confirm by signature that all the above points have received pre-delivery service.

Signature:..... Position:..... Date: / /

2 I, the owner of the above mentioned Agrowdrill, take delivery of the machine.

Signature:..... Position:..... Date: / /

Top Copy (White) - Forward to Agrowplow. *Second Copy (Yellow) - Dealer's Copy.* *Third Copy (Pink) - Customer's Copy.*

AgrowForm-01/Revision 1

INSTALLATION & WARRANTY REGISTRATION FORM

AGROWPLOW
Soil Care Systems International Pty Ltd
134 Thornton Street, Wellington NSW 2820; P O Box 270, Wellington NSW 2820
Phone: (ISD 612) (STD 02) 6845 1566
Fax: (ISD 612) (STD 02) 6845 1603
Email: agrow@well-com.net.au Web Site: http://www.well-com.net.au/~agrow/

Installation Date: .....

Serial No: .....

AGROWPLOW -
"Prosperity through Soil Care"

Note: This **form must be completed** and then **signed by both the Dealer and the Customer.**
The **top copy must be returned to Agrowplow within 7 days** of installation.
Important: For installation to be completed, **all questions must be answered in the affirmative before signing** this form.

Please Check the box on each question to indicate that the installation procedure is completed.

1 Has the Pre Delivery Checklist Form been completed and signed? ❑

2 Are all safety decals, guards and covers in place? ❑

3 Has the Customer received and read the operator's manual? ❑

4 Has the Customer been fully instructed by the Dealer in the operation of the machine in actual working and transport situations? ❑

5 Is the Customer satisfied with the product's performance? ❑

6 Is the Customer fully instructed in the product's service & maintenance? ❑

7 Does the Customer understand the Agrowplow Warranty Policy outlined in the operator's manual? ❑

Important:
By signing this Installation & Warranty Registration Form:

a) The Customer acknowledges that he/she is trained and fully responsible for the safe operation of the Agrowdrill.

b) The Customer undertakes further, to fully train any person who might be required to operate the Agrowdrill.

c) The Dealer meets the obligations of installation, service and warranty start-up.

DEALERSHIP:

Name: .....

Address: .....

..... Postcode: .....

Dealer's Signature: .....

Print Signatory's Name: .....

CUSTOMER:

Name: .....

Address: .....

..... Postcode: .....

Customer's Signature: .....

Important: Warranty obligations cannot be met until the top copy of this Installation & Warranty Registration Form has been returned to Agrowplow.

Top Copy (White) - Forward to Agrowplow. *Second Copy (Yellow) - Dealer's Copy.* *Third Copy (Pink) - Customer's Copy.* AgrowForm-02/Revision 1

Soil Care Systems of Farming

This section outlines the origins and principles of the Soil Care System of farming.

The origins of Agrowplow, began with observation and concern about devastating effects of conventional cultivation on Australian soils.

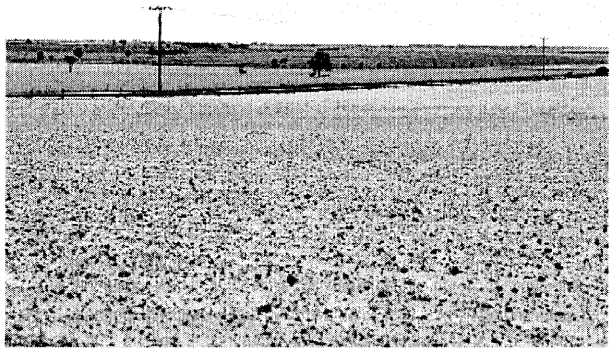
Today, Agrowplow remains focused and dedicated to the development of innovative farming practices and equipment to improve and protect our nation's greatest asset - the soil!

Soil Degradation

Traditional cultivation and sowing techniques, which require soil to be ploughed and cultivated before sowing, have caused erosion by wind and rain and severe break down of soil structure.

Continual passes of the tractor and deterioration of soil structure have also formed compacted layers below the soil surface.

Below: Traditional cultivation practices.



Above: Wind erosion on traditionally cultivated soil.

These soil damaging factors combine to seriously limit plant growth and yields, and erode our precious asset.

In the case of compacted layers water absorption is prevented and root growth is restricted, prohibiting the plants access to nutrients.

Helpful soil microbes and earthworms are reduced or eliminated because poor soil structure causes pastures to become water-logged quicker, dry out faster, and often make tillage operations almost impossible.

Below: Water erosion on traditionally cultivated soil.

Traditional cultivating practices are always aimed at controlling weed growth and preparing a fine "seed-bed". Unfortunately these practices destroy soil humus, expose soil particles to erosion, compact the soil, restrict moisture penetration, reduce root growth and plant yields.

In order to maximize farming profits while still protecting the environment these problems must be overcome.

The "Soil Care System" approach to farming is different because it promotes the health of both "seed-bed" and "rootbed" in a sustainable way - working with nature rather than against it.

New farming techniques are evolving together with new equipment to give simple, logical compatible answers.

The Solution

Agrowplowing or non-inversion tillage (sometimes referred to as conservation tillage), as well as, direct drilling and minimum tillage provide positive answers to sustaining soils for highly productive farming. The Agrowplow Soil Care System of farming encompasses these techniques.

The Soil Care System of farming has been developed to provide farmers with better returns from their crops and stock. It advocates no tillage or minimum tillage because of moisture losses and soil degradation brought about each cultivation.

The unique range of specially developed Agrowplows and Agrowdrills are machines which will allow you to obtain the best advantages of non-inversion tillage, direct drilling and minimum tillage practices - for crop and pasture establishment in conservation farming systems.

Soil Care Systems of Farming

Agrowplowing or non-inversion tillage lifts and shatters hard soil pans without soil inversion. The task is accomplished with minimum soil surface disturbance ensuring that precious top soil is left on the surface and minimal moisture is lost to the atmosphere.
Top soil is not mixed with less fertile subsoils or less fertile subsoils mixed with fertile top soil.The topsoil remains virtually undisturbed and is less susceptible to wind and water erosion than conventionally cultivated soils.

No-Till direct-drilling, known as zero-till or no-till, is the term given to establishing crops and pastures with out any tillage. Control and reduction of vegetation and weeds is achieved by either chemicals or livestock or both.

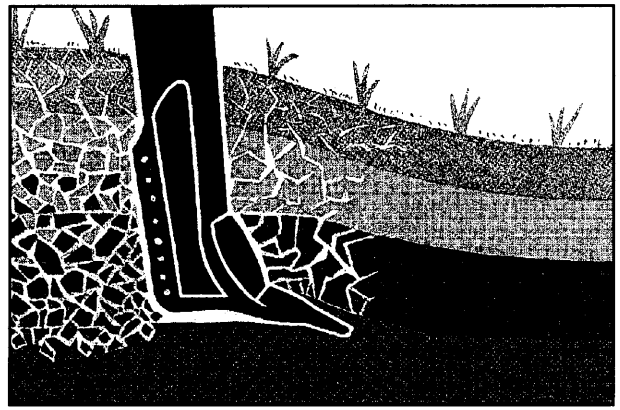
Non-inversion tillage and direct drilling go hand-in-hand. Direct drilling promotes the benefits of agrowplowing reducing risk of erosion and prolonging the effect of deep ripping through less soil traffic.

Below: Agrowplowing breaks up compaction in vineyards.

Minimum-Till direct-drilling or reduced tillage refers to using a mimimum amount of tillage for preliminary seedbed preparation, and direct drilling for seeding. Various combinations of tillage, chemicals and livestock are used to control weeds.

All these methods can be used in a variety of ways to suit each soil and seasonal condition for creating healthier,sustainable rootbed and seed bed enviroments.

Below: These two Sunflower plants show differences that occur with root system development under conventional tillage and seeding (left), compared to those grown using the Agrowplow and Agrowdrill (right).



The patented Agrowplow shank and digging blade features minimal draught and avoids soil inversion. The digging blade works below the hard pan, lifting upwards and breaking the soil sideways without soil inversion.

Agrowplowing or Non-InversionTillage

The patented design of the Agrowplow prepares and renovates the root zone of the soil without inversion.

This unique ability of rootbed renovation improves water infiltration, humus levels, soil structure and sustainable productivity. Root development is enhanced by an unrestrictive soil enviroment.

The following section outlines problems of soil compaction, causes, remedies, and the advantages of Agrowplowing.

The Problem of Soil Compaction?

Soil compaction is a form of soil degadation. It strangles the life out of soil. Yield losses of up to 40% are not uncommon. In extreme cases yields can be reduced by up to 80% and severe erosion can occur.

Soil Care Systems of Farming

What Activities Cause Soil Compaction?

Normal farming activities using tractors, implements, headers, vehicles, cultivation, livestock and irrigation will cause soil compaction.

The weight of vehicles and livestock compress the soil. Cultivation breaks down soil aggregates, soil structure, porosity and humus. The worst damage occurs in wet soils, with high stocking rates, frequent vehicle traffic and intensive cultivation.

Any activity which reduces the porosity or bulk of your soil is causing soil compaction.

Compacted soil becomes more dense and in turn, decreased porosity of the soil reduces:

- water infiltration
- humus levels
- soil aeration
- water drainage
- worm activity
- microbe activity
- water retention
- root growth
- crop yields

How is Soil Compaction Rectified?

Step 1

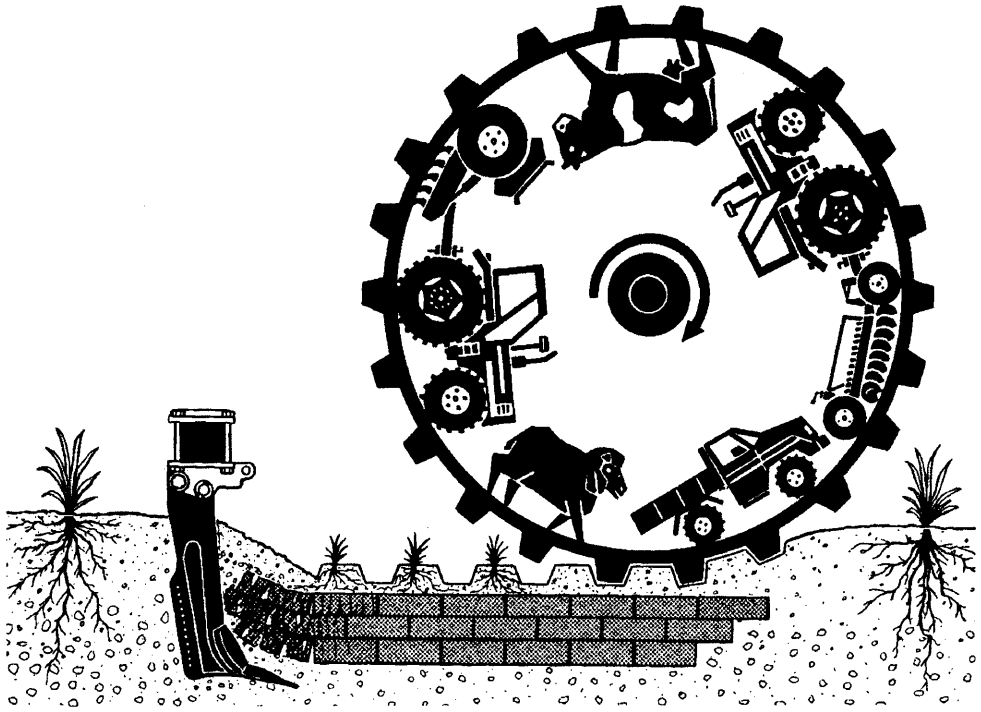
Break up compacted soils, hard pans, clay pans, tillage pans and impenetrable barriers with an Agrowplow.

Step 2

Re-establish plants with strong, deep root systems to rebuild and hold the soil structure, bulk and porosity in a healthier state - Preferably using direct drilling or minimum tillage techniques.

Step 3

Use farming practices which minimise soil cultivation, soil inversion and traffic in wet soils.



Right:
An illustration of a compaction roller symbolising the soil compaction caused by every day farming activities. The soil restoration given by the unique Agrowlow shank is also shown.

Advantages of Agrowplowing

Agrowplows are used for both primary and secondary tillage, without soil inversion and minimising moisture loss. The narrow edge-on tine design substantially reduces tractor horsepower requirements.

The low angle digging tool and narrow shank of the Agrowplow ensures that the previous crops' root systems are fully retained in the soil thus improving structure, adding humus, increasing infiltration and holding moisture whilst allowing greater utilization of nitrogen created by legume Rhizobium bacteria.

The Agrowplow can be successfully applied in most situations. It has been used extensively in the farming of cereal, cotton, sugar, vegetables, vineyards and orchards under both dryland and irrigation farming methods.

Agrowplowing is particularly effective in pasture renovation and the control of water run-off, allowing infiltration and storage within the soil. Wind erosion is reduced and salination problems can be reduced.

Hardpans and barriers, created by fine particles moving downwards into the coarse soil structures creating an almost impenetrable layer, can be eliminated

Research has often demonstated the benefits of agrowplowing.

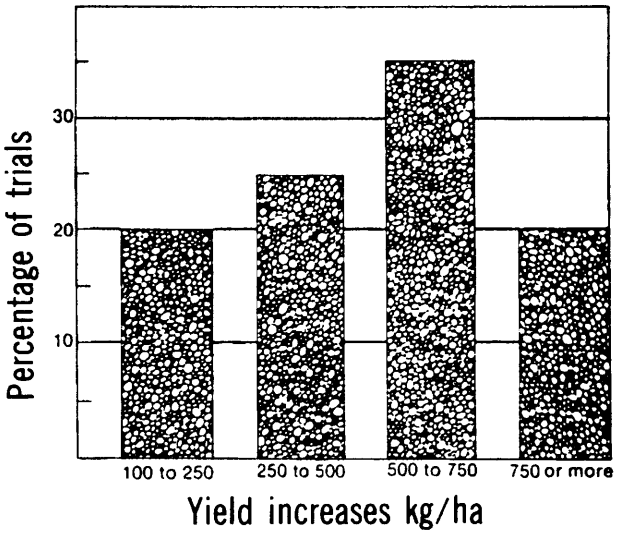
Benefits include wheat roots being able to penetrate the ripped soil faster and deeper to absorb more soil moisture, capture more soil nutrients and improve yield.

Soil Care Systems of Farming

Yield increases of wheat from 20 trials on Wongan loamy sand and Eradu sandplain in Western Australia, between 1981 and 1984 are illustrated in the graph below.

The trials have been grouped into four response categories. The percentage of trials in each category is shown. The average improve yield response was 490 kg/ha. See graph below.

From Farm Note No. 61/85 Agdex 100/21
Western Australian Department of Agriculture.



It should be noted that hard pans can be re-established quickly unless tractor traffic is reduced. Normal cultivation requires many more passes of a tractor than direct drilling.

It was shown that only four passes of a tractor on a virgin Eradu sandplain soil was enough to form a hard pan which reduced grain yield by 38 per cent.

Deep tillage has proved extremely beneficial mainly on light soils. On heavy soils, apparent responses from deep ripping were due to the fallowing effect of the operation which can be obtained with shallower workings. Soil structure of heavy red clays has been shown to deteriorate with cultivation.

Measurements from many soil types indicate that the depth of the traffic compaction layer varies according to soil type. Generally, the lower the clay content of the soil, the deeper the hard pan formation.

Wongan loamy sands which have 10 to 12 per cent clay, have a hard layer at about 20cm. Some sites with more clay have a hard pan at 15cm. Yellow earthly sands such as Eradu sandplain have a clay content between 6 and 8 percent and the hard pan is at 25 cm depth. Deep white sands with a low clay fraction have a pan at 30cm or more.

The following factors should be considered before soils are Agrowplowed:

- soil type
- shank spacing
- time of ripping (and soil moisture)
- speed of working
- depth of working
- residual benefit from one Agrowplowing
- crop type.

Unique Shank Design

Agrowplow's unique tine is set to work below the compacted plough pan to uplift and shatter it without inversion of the soil.

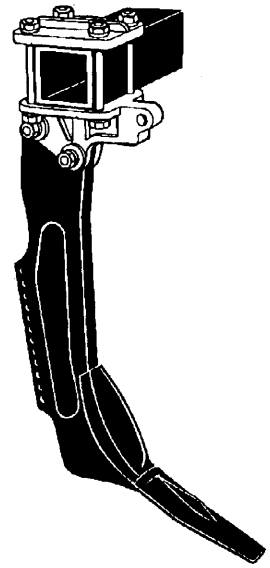
Soil particles become aerated without violent separation while allowing greater moisture penetration and infiltration into the bed. This minimizes fine soil aggregates and creates conditions ideal for microbial action.

Crop roots are then free to pursue moisture and nutrients deep in the soil. Crop rotation and the planting of deep rooted legumes also assists in developing and maintaining a healthy root bed.

The Agrowplow has been engineered to operate in a wide range of soil conditions whether they be black, heavy soils or the light, sandy, abrasive types. Soil type does not affect successful Agrowplowing or non-inversion tillage.

Non-Inversion tillage allows the legume roots to develop deep in the soil profile where nitrogen fixing bacteria produces nodules. This not only increases nitrogen in the root bed but also organic matter, which gives a fertile, friable soil structure.

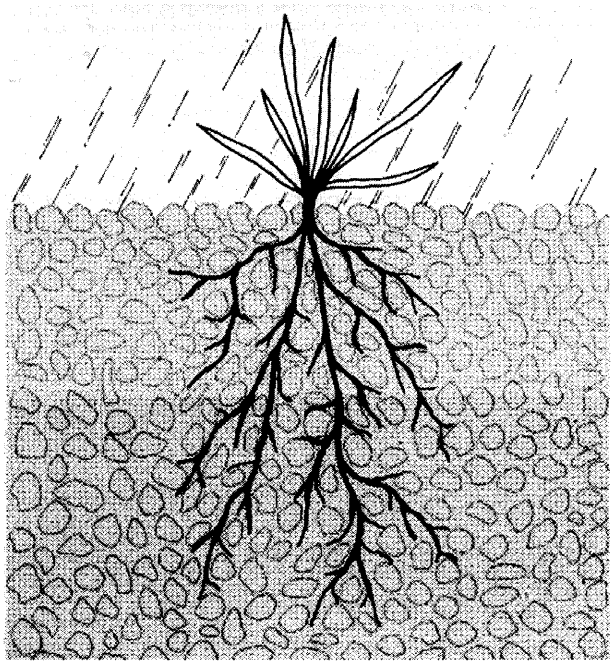
The unique shank design of the Agrowplow is suited to both primary and secondary tillage applications - eliminating soil inversion and minimising moisture loss.



The narrow edge-on tine design substantially reduces tractor horsepower requirements.

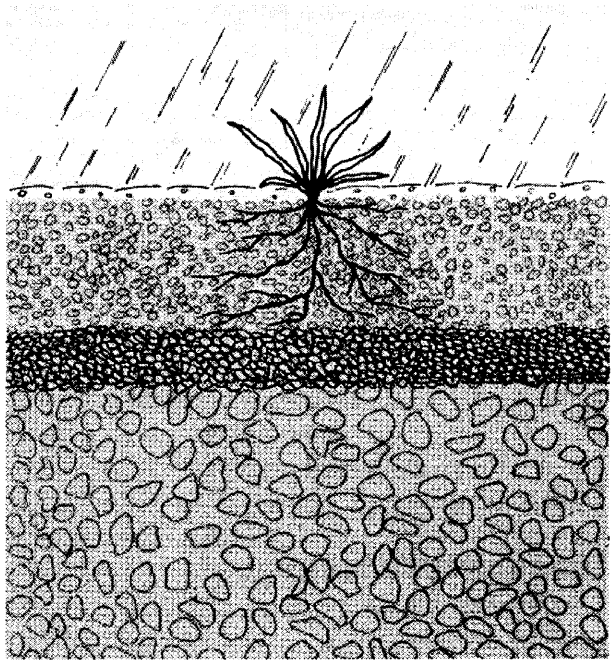
Soil Care Systems of Farming

Compare the differences between Agrowplow Rootbed Renovation & Conventional Tillage



Non Inversion Tillage:

- Kills weeds by lifting & separating soil without inversion.
- Creates rootbed with minimal fining of soil aggregates.
- Soil decompaction increases water infiltration.
- Retains and builds organic matter (humus levels).
- Aerates the soil (allows soil & microbes to breath).
- Increased worm & microbe activity.
- Agrowplow eradicates hard pans.
- Agrowplow decompacts vehicle and stock compaction.
- Unrestricted root growth & nutrients more accessible.
- Increased water infiltration and storage.
- Erosion control.
- Increased yields.
- Sustainable Soil Care Farming.



Tillage which inverts and mixes soil:

- Kills weeds by smashing, mixing and inverting soil.
- Creates fine soil aggregates for seedbed.
- Fine soil gives surface sealing and water run-off.
- Breaks down & depletes organic matter (humus levels)
- Fine soil reduces aeration (denser soil structure)
- Reduced worm & microbe activity
- Soil fines and tillage create hard pans
- Vehicle and stock cause soil compaction
- Restricted root growth & smaller root volume
- Restricted water penetration, less water stored
- Increased erosion
- Reduced yields
- More soil disturbance & degradation - Unsustainable.

Above: The economic benefits of using an Agrowplow are dramatically illustrated here, by the differences between the plants and roots from compacted soil (left), and the plants and roots from renovated soil (right).

Soil Care Systems of Farming

Above: Inverted "T" grooves from direct drilling using coulters and Baker Boots

Direct Drilling

This section explains many of the enviromental and economic advatanges of direct drilling.

Environmental Advantages

Direct drilling prevents the soil from being exposed to wind and water eroision - the main causes of erosion on cultivated soils, and the effect of reduced traffic minimises soil compaction. Zero cultivation avoids degradation of soil structure.

The primary reason for cultivation is to kill vegetation that consumes moisture from the soil. This can now be achieved by alternative methods.

A big advantage of direct drillng is that it allows soils to improve and become more friable with time. As increased organic matter is retained and broken down, it is combined with the soil as humus. Soil structure is improved by this organic matter, making it more porous for better aeration and water infiltration.

The reduction of soil compaction (due to less traffic and soil degradation) allows full moisture retention to be achieved. The plant can then use the soils full potential of stored moisture, and can pursue water and nutrients deep into the soil.

Studies have shown that earthworms have increased by at least fifteen times using this method (trials at Emerald, Queensland and the source is from Qld DPI).

Soil microbes are also returned to the soil and these beneficial organisms aerate the soil. This further helps to break down organic matter and make nutrients available.

Utilising chemicals and livestock, modern farming is able to control weeds and maintain a good ground cover. Erosion is therefore reduced and evaporation is kept to a minimum.

Economic Advantages

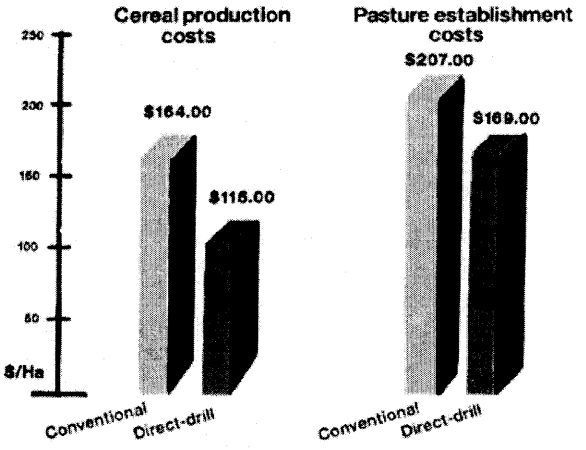
As the cost of farming continues to rise over the next decade any increase in margins is an advantage to farmers.

Compared to conventional cultivation, direct-drilling will save time and money, and also reduce replacement expenditure on plant and equipment.

Look at the advantages enjoyed by farmers who have adopted direct-drill and mlnimum-tillage techniques:

- Improved soils
- Reduction of capital costs by up to 40%.
- Greater length of grazing time (between two and four months), allowing carrying capacity to be lifted in mixed enterprises.
- Flexibility in cropping programs.
- Yields superior to conventional cultivation.
- Reduced labour requirements - less time is spent on the tractor.
- More control over timing of sowing and related activities.
- Reduced costs of production.

Compare the following results established at 'Ibstock', Wellington, NSW:



Reduced Tillage or Minimum Tillage

This section explains many of the enviromental and economic advatages of reduced or minimum tillage practices.

Environmental Advantages

Reduced tillage minimises cultivation and soil exposure to wind and water eroision. Less traffic also reduces soil compaction and fewer cultivations reduces degradation of soil structure.

Soil Care Systems of Farming

Above: Direct drilled wheat.

Under conventional methods, the primary reason for cultivation was to kill vegetation that consumed moisture from the soil.

Under minimal tillage techniques, cultivation is used primarily to loosen the soil and form a level soil surface for better sowing conditions, especially after wet winters and heavy stocking.

Cultivation is also used to encourage weed germination before applying weedicides and direct drilling.

Economic Advantages

Like direct-drilling, reduced tillage or minimium tillage practices can significantly reduce fuel, labour and equipment costs.

Planning to Direct Drill

Planning is the key to direct drilling and reduced tillage techniques. Planning must take into account gross margins, marketing (if applicable), paddock history, crop rotation, soil type, fertility (using soil tests), weed history and densities as well as long term development plans.

Flexibility of operation is also essential. For example, it will be advantageous if work can be achieved within such confines as weather, man power availability, etc.

Weeds should be controlled in the pasture phase using chemicals, livestock and chipping - to reduce the seed bank. This greatly facilitates the control of weeds during the fallow and seeding periods.

In continuous cropping, weeds are controlled during the previous cropping phase. It is important to keep plant growth to a minimum during this fallow stage to prevent trans-evaporation from reducing the soil moisture.

The three main control agents are chemicals, livestock and not least, flexibitility on the part of the farmer.

If minimum-tillage is being used, the ground often requires preliminary cultivation. This is often used to level the seedbed and initiate weed germination. Especially hard setting soils may need more tillage.

Many farmers use an Agrowplow for non-inversion tillage to break up the compacted layers allowing water to freely enter the soil during the fallow period.

A herbicide application is usually made about ten days before sowing to kill all germinated weeds.

Above: Direct drilled barley.

If moisture content and also livestock compaction is noted and assessed beforehand, stock can usually be grazed right up to this time.

Safety Instructions

Safety is the Operator's Responsibility

The AD95 Agrowdrill is a robust and versatile direct drill capable of operating under a wide variety of conditions. It can be used for direct drilling applications, as well as traditional cultivation and seeding - to maximise seed germination and plant establishment for pastures, summer crops, cereals, oil seeds and legumes.

The Agrowdrill presents an operator with hazards associated with setting up, on and off-road transport, tillage and seeding applications, as well as machine service and maintenance. The operator must be aware of these hazards.

The dealer explains the capabilities, safe application, service requirements and restrictions of the Agrowdrill.

The dealer demonstrates the safe operation of the Agrowdrill according to Soil Care Systems International instructions. The dealer can also identify unsafe modifications or use of unapproved attachments.

The following publications provide information on the safe use and maintenance of the Agrowdrill and attachments:

- The **Operator's Manual** delivered with the Agrowdrill gives operating information as well as routine maintenance and service procedures. It is a part of the Agrowdrill and must stay with the machine when it is sold.

  Replacement Operator's Manuals can be ordered from your Agrowplow dealer.

- The Agrowdrill has **machine** decals which instruct on safe operation and care. The decals and their locations are shown in the Operator's Manual.

  Replacement decals are available from your Agrowplow dealer.

Safe Operation Needs a Qualified Operator *

Qualified Operators Must Do the Following:

1. *Understand the Written Instructions, Rules and Regulations

- The written instructions for the operation of the Agrowdrill are included in the Agrowdrill Operation & Maintenance Manual and on machine decals.

- Check the rules and regulations for your location. These rules may include any Federal and State safety requirements.

2. *Have Training with Actual Operation

- Operator training must consist of a demonstration and verbal instruction. This training is given by your dealer before or when the Agrowdrill is delivered.

- In signing the Predelivery Checklist when taking delivery of the Agrowdrill, the owner understands and undertakes responsibility for further training of any new operators of the Agrowdrill.

- New operators must start in an area without bystanders and use all the controls until they can operate the Agrowdrill safely under all conditions of the work area.

3 *Know The Work Conditions

- Operators must know any prohibited uses or work areas. They need to know about excessive slopes and rough terrain.

- Operators must know the local road transport regulations, and understand the dangers and requirements of transporting wide and heavy equipment.

- Always wear protective clothing when maintaining or servicing Agrowdrill.

- For operators to be qualified, they must not use drugs or alcoholic drinks which impair their alertness or coordination while working.

  Operators who are taking prescription drugs must get medical advice to determine if they can safely operate a machine.

Safety Instructions

WARNING!

READ THESE SAFETY INSTRUCTIONS CAREFULLY BEFORE ALLOWING ANY PERSON TO OPERATE THE AGROWDRILL

- **Never leave the** Agrowdrill **in a raised position** when not in use. Accidental release of control levers or hydraulic hose failure will cause implement to drop down. This can cause serious injury to someone near or under the machine.

- **Do not transport the Agrowdrill without the tractor drawbar being in a locked position.** Transporting without drawbar locked will result in loss of implement control and serious damage or injury.

- **Do not transport at speeds in excess of 20 kph.** Transporting at faster speeds may result in loss of implement control and serious damage or injury.

- **Do not transport an** Agrowdrill **with a vehicle of less gross mass than that of the** Agrowdrill being towed. Transporting with a smaller lead vehicle will result in loss of implement control and serious damage or injury.

- **Do not pull trailed** Agrowdrills **from any point other than from the tractor drawbar.** Pulling from a point other than the designated tractor drawbar can result in tractor instability and cause serious damage or injury.

- **Do not operate or transport the** Agrowdrill **with a loose wheel, rim or hub, and be certain that tyres are inflated to specified pressures.** Loose studs and/or under inflated tyres cause machine instability which can cause serious damage or injury.

- **Do not make any adjustments to an** Agrowdrill **until all people** who may be close to the machine are considered **safe from any potential danger** which may result from adjustment.

- **Do not use your feet to clear coulters, tines and soil openers.** These may be very sharp and cause serious injury.

- **Use hazard warning lamps and signs** as required when transporting the Agrowdrill on public roads.

- **Use due care** when adjusting or maintaining any aspect of the Agrowdrill. Failure to do so may result in serious injury.

- **When undertaking maintenance** on the Agrowdrill the operator must ensure that the tractor is turned off and hydraulics are fully lowered. Accidental release of control levers or hydraulic hose failure will cause implement to drop down. This can cause serious injury to someone near or under the machine.

- If the Agrowdrill must be in a raised position for service or maintenance, **ensure the unit is securely supported with blocks or proper support stands.** After blocks are in place, release the hydraulics and stop the tractor engine before starting maintenance work.

If supports are not used, accidental release of control levers or hydraulic hose failure will cause implement to drop down. This can cause serious injury to someone near or under the machine.

- **Before moving the machine**, the operator must make sure the area is well clear and sound the horn as a warning before moving.

- **Do not remove** any safety or instruction decals, transport or hitch attachment pins from the Agrowdrill.

- **If operated incorrectly** the Agrowdrill can cause serious injury or death.

Warranty Policy

Soil Care Systems International Pty Ltd trading as AGROWPLOW warrants to its Authorised Dealer, who in turn, warrants to the original purchaser (Owner) that each new Agrowplow product, part or accessory will be free from defects in material and workmanship for twelve (12) months after delivery and installation by an Authorised Agrowplow Dealer, according to the conditions outlined.

This warranty does not cover damages resulting from abuse, accidents, alterations, normal wear or failure to maintain or use the Agrowplow product with due care.

During the warranty period, the Authorised Agrowplow Dealer shall repair or replace, at Agrowplow's option, without charge for parts and labour any part of the Agrowplow product which fails during normal use and operation because of defects in material or workmanship. The Owner must provide the Authorised Dealer with prompt written notice of the defect (within 14 days of its occurrence), and allow reasonable time for replacement or repair.

Agrowplow (at its option) may request failed parts to be returned to the factory. Any travel time of a service technician and/or transportation of the Agrowplow product to the Authorised Servicing Dealer for warranty work is the responsibility of the Owner.

This warranty is in lieu of all other warranties (except those of title), expressed or implied, and there are no warranties of merchantability or fitness for a particular purpose. In no event shall the Authorised selling Dealer or Agrowplow be liable for downtime expenses, loss of machine use, loss of crops, loss of profits, injury or damage arising from accident, direct or indirect loss, or other incidental, consequential or special damages.

Conditions of Warranty

1 The warranty is **not transferable** to any third party or subsequent purchaser.

2 The Installation & Warranty Registration Form (see page 6, AgrowForm-02) **must be filled in and returned to** Agrowplow by the Dealer within seven (7) days of delivery and installation of the unit. By signing the Installation & Warranty Registration Form, the owner acknowledges that he is responsible for the safe operation of the product, and that he undertakes to fully train any person that might operate the pruduct.
Only when the Installation and Warranty Registration is **completed and returned**, can Agrowplow fulfil all warranty obligations.

3 **Components and conditions not covered by warranty include:**

- **Abuse** — Failure resulting from neglect, such as improper operation, lack of required maintenance or continued use of a machine after the discovery of a defect which results in greater damage to the unit.
- **Environmental Conditions and Application** — Deteriorated or failed components such as hydraulic hoses, seals, valves or connections damaged by corrosive materials, dirt, sand, excessive heat or moisture.
  Warranty determination for these types of failures will be made by Agrowplow only after inspection of failed components.
- **Normal Wear** — Normal wear and consumable items such as oils and lubricants, nuts, bolts, washers, grease caps, spanners, jacks, bearing housings, axles, poppet valves or seal kits for hydraulic cylinders, seals, points, discs, axles, tyres, machine adjustment and periodic service. These are considered to be normal wear items and are not warranted.
- **Maintenance** — Component failure caused by non performance of scheduled maintenance such as correct lubrication and maintenance, tightening or replacement of bolts, nuts, fittings, shields and covers.

Conditions of Warranty continued

3 Components and conditions <u>not covered by warranty include:</u>

- **Damage** — Damage or machine failure caused by carelessness or accidental damage, improper operation, inappropriate transportation or storage of the plough, parts or attachments.

- **Alterations** — Any unauthorised alteration, modification, attachments or unauthorised repairs to the Agrowplow product, parts or attachments. Written approval must be obtained from Agrowplow for any such items to maintain warranty.

- **Replacement Parts & Service Work** — The labour or expenses involved in any of the following replacements or service tasks is the responsibility of the owner:
  (1) Replacement of faulty tines. (2) Soil opener replacement. (3) Metering roller adjustment or replacement.
  (4) Any bearing replacement. (5) Adjustments (refer to manual). (6) Drive shaft adjustment or replacement.
  (7) Periodic service work.
  Agrowplow and its Dealers are not responsible or liable for any such expenses.

- **Clean-up Time** — Agrowplow does not pay for cleaning the products, parts, accessories or work area before or after the warranty repair. Clean-up time is affected primarily by the application or conditions in which the unit is operated and maintained. Since clean-up time can be so variable, cleaning time should be considered a customer expense.

- **Transportation & Insurance Costs** — Warranty does not cover transportation or insurance costs for its products or other equipment needing repair or replacement of warranted components. Nor does it cover any freight or insurance costs in obtaining new parts or returning old parts to Agrowplow for inspection purposes.

- **Travel Time** — Travel time required for warranty repairs is the responsibility of the Owner.

- **Diagnostic Time** — Warranty does not cover time required to diagnose a warranty problem. Diagnostic time is affected greatly by the training and expertise of the technician employed to do the job. With proper training of service personnel, diagnostic time should be at a minimum. Agrowplow expects that Dealers will assign a well trained and proficient technician to handle any warranty repairs.

- **Non-Genuine Parts** — Use of parts other than Agrowplow parts for repair of warranted parts will automatically negate any warranty. Warranted components must be replaced with genuine Agrowplow repair parts.

- **Unauthorised Repairs** — Repairs by an unauthorised agent will automatically forfeit any warranty. Warranty repairs must be carried out by an Authorised Agrowplow Dealer only, and only after Agrowplow's authorisation has been obtained.

4 Special Warranty Considerations apply in respect to the following:

a) Tyres: Tyres are covered by the tyre manufacturer's warranty. Claims for tyre faults must follow Agrowplow's normal claim procedures.

b) **Contractors:** Owners who undertake contract work with their Agrowplow product are **limited to a 90 day warranty period.**

Agrowdrill Description & Application

This section explains the development and operating principles of the company's Agrowdrill.

Why was the Agrowdrill Developed?

Designed and built in Australia the Agrowdrill is an integral part of the Soil Care System of farming which regenerates and sustains soils for improved agricultural production.

Most Australian Soils are Extremely Fragile

We have damaged our soil immeasurably in a few brief decades of cultivation. Traditional cultivating practices for "seedbed" preparation and seeding are not well suited to our Australian soils and environment.

The soil is your most important economic resource. Looking after your soil should be your first priority. Healthy, fertile soil, minimal erosion and careful management are essential if your farm is to remain viable in the long term.

What can you do to conserve your soil?

There is no simple management strategy that will work for all farmers, all enterprises and all soil types. However there are some general "Soil Care" guidelines that will help.

The Soil Care Systems guidelines are:

1 Less cultivation.
2 Less inversion of the soil.
3 Maintenance of decaying crop & pasture residues on the soil surface.
4 Encouragement of moisture penetration and root growth.
5 Decompaction and Reduced Bulk Density of the "Rootbed".
6 Timely and accurate seeding of pastures and crops.

The Agrowdrill has been developed as an integral part of the Soil Care Systems, to help do this!

1 Less cultivation

The Agrowdrill is designed from the ground up to perform well in direct drilling of uncultivated ground.

2 Less inversion of the soil

The top 5cm of your soil is the most valuable and is best kept where it belongs - on top!

Most conventional tine and disc implements pulverise and invert the soil to some extent. The use of a "non-inversion" implement such as an Agrowplow for any necessary cultivation will prevent this.

3 Maintenance of decaying crop and pasture residues on the soil surface.

Using an Agrowplow or the Agrowdrill does not require removal of surface trash cover. Both implements are designed to handle large quantities of surface trash.

4 Encourage moisture penetration and root growth.

Maintaining surface trash cover, reducing compaction and improving soil structure ensures better moisture penetration, greater moisture retention, stronger root and plant growth.

5 Decompaction and Reduced Bulk Density of the "Rootbed".

Using an Agrowplow to decompact and aerate the soil helps to improve moisture penetration, moisture retention, soil organism activity - creating conditions for stronger root growth and better structured soils.

Using an Agrowdrill for seeding by direct drilling will reduce compaction, minimise soil degradation and encourage and sustain a "healthy" soil.

6 Timely and accurate seeding of pastures and crops.

Direct drilling using the Agrowdrill will allow you to seed ON TIME after rain, without having to wait for extra cultivation or cultivated soil to dry out sufficiently to be able to work.

The Agrowdrill is designed to **accurately** place seed and fertiliser into uncultivated soil or cultivated soils.

Soil Structure

The term "Soil Structure" is used to describe the arrangement of the particles in the soil. Well structured soil is loose and friable, with plenty of air spaces between the particles of soil. (see figure 1)

Soil particles are joined together with humus forming larger "aggregates" which allow large spaces between them. This allows easy penetration of water, air and plant roots. These spaces are also important as storage for moisture.

Soil with poor structure does not have well developed "aggregates". Soil particles separate. Clay soil will dissolve in water and then set like cement on drying. This allows little air and moisture penetration. Beneficial soil organisms such as worms and bacteria will not thrive and plant roots will not penetrate easily.

Agrowdrill Description & Application

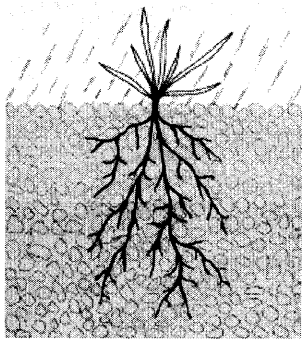


Figure 1

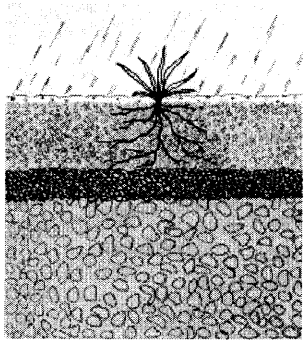


Figure 2

A light sandy soil or heavier soil with poor structure will hold little moisture or nutrients and be a poor environment for soil organisms and roots.

Soil structure decline is the predominant form of degradation affecting soils in the cropping districts of Australia. Cultivation practices rapidly destroy the bulk organic matter or the soil humus - the soil humus which is the lifeblood of soil structure.

Structural degradation is now causing more economic loss in Australia than more recognised problems such as water and wind erosion.

Soil Compaction

One of the main causes of soil structure decline is cultivation. Traditional cultivation techniques aim at breaking down the soil into a fine state ready for seeding. This usually involves a number of workings with disc or tine implements and a lot of heavy traffic.

This makes it easy to place the seed and ensure good germination BUT in the long term it destroys the structure of the soil. Each pass with an implement pulverises and compacts the soil. Each wheel track compounds the problem even further.

Frequent cultivation also develops "hard pans" - compacted layers under the soil surface which are impervious to moisture and plant roots. (See figure 2)

Vehicle traffic is another major cause of soil compaction in a pasture situations. This significanty reduces the productivity of the pasture and farm income.

What's Special about the Agrowdrill?

The Agrowdrill is the most robust, versatile direct drill available in Australia. It maximises seeding versatility for pasture renovation, summer crops, cereals and legumes - from specialised direct drilling to traditional farming applications.

The range of Agrowdrills are designed to meet a wide range of grazier and mixed farmers' needs in cropping and pasture applications.

Each machine is capable of doing a number of jobs which enables the capital investment on machinery to be minimised.

Agrowdrills can be used in a range of one pass direct drilling and conventional cropping practices, and can handle most seed and fertiliser types.

There are a number of crucial features of the Agrowdrill which allow it to perform well in tough conditions. These include:

- Extremely rugged construction and plenty of weight to penetrate the soil.
- Flexicoil tine with high breakaway force capabilities. Two versions are available.
- Very strong coil tines with a high breakaway force which maintain the critical digging angle and position of the soil opener.
- The use of inverted "T" (Baker Boot) soil openers.
- Strong coulter design.
- Wide variety of soil openers to suit varying soil conditions.

Agrowdrill Description & Application

The Right Tools for Seeding

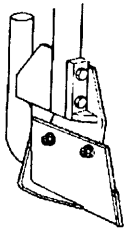
Soil types and the amount of ground cover makes the selection of planting equipment very important. Only careful selection can alleviate problems associated with sowing into no-tillage or reduced-tillage conditions.

The requirements of soil openers vary with different soil type and conditions, and in particular with the amount of stubble present.

The Agrowdrill was therefore designed with the flexibility to accept a variety of openers for almost every soil condition.

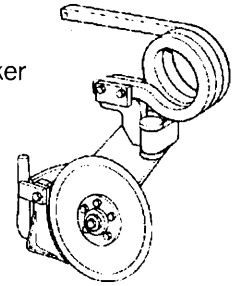
- **The Baker Boot.**

This produces an inverted T that promotes soil humidity which assists germination. It is ideal for pasture establishment and cropping in most soil conditions.



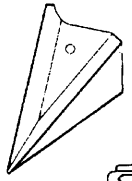
- **The Self Aligning Coulter.**

This is similar in effect to the Baker Boot but can handle heavy sods and stubble conditions. The self aligning coulter is not available for AD95 models.



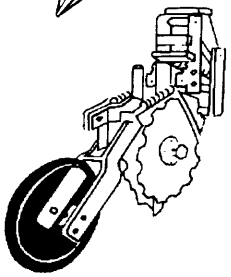
- **The Spear Point.**

For use in black soil. It can be used to 'chase' moisture, placing the seed in the optimum position for quick germination.



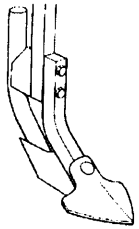
- **The Acraplant Assembly**

The most effective way to place seeds in heavy trash. It gives improved germination by parallelogram depth control and integrated press wheels.



- **Conventional "6" Cultivating Point.**

This is used in normal cultivating situations. It can cultivate weeds out while sowing accurately.



Agrowdrill Description & Application

Advantages of the Baker Boot over other Alternatives?

The following outlines essential differences between the Baker Boot, the single disc seeder, the twin and triple disc seeders and conventional tines/openers used for direct drilling:

The Baker Boot

The action of the Baker Boot is quite different to the other openers used in direct drilling. **The Baker Boot opener is capable of producing the most ideal environment for maximum seed germination and plant establishment, especially in drying soil conditions.**

As Figure 3 shows, the seed is placed at the bottom of a narrow slot into moist loose soil. The narrow slot and minimal surface disturbance ensures minimal moisture loss, maximum germination, quicker plant development, and little risk of soil erosion.

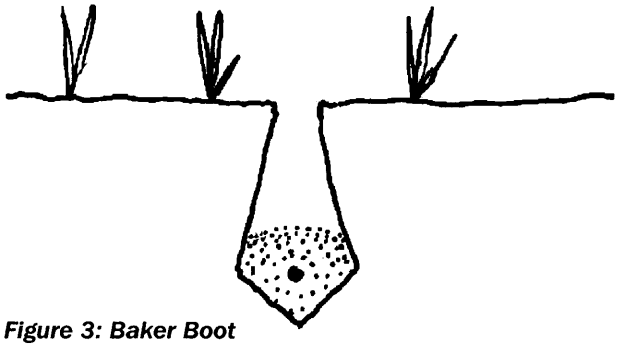


Figure 3: Baker Boot

*With minimal soil distrubance, the **Baker Boot** places the seed into a narrow groove of soft loose soil which maintains high moisture or humidity levels to enhance seed germination and establishment.*

There is little "smearing" or "compacting" of the soil as the opener passes through the soil. Therefore the tiny roots of emerging young seedlings easily enter the soft earth and quickly support the plant.

In drying conditions, the germination and plant growth obtained from direct drilling with the Baker Boot is radically superior to other openers.

The Baker Boot has no moving parts and the very narrow profile gives lower draft requirements, easier penetration and less wear.

The use of coulters minimises soil disturbance and improves trash handling.

Single Disc

Single disc soil openers use only one disc, which is dished, mounted at an angle to the direction of travel.

The action of the single disc slices the soil and moves it to one side. The seed is then dropped in the furrow or open groove created by the disc. The seed is covered by soil falling back into the furrow or often left in the open.

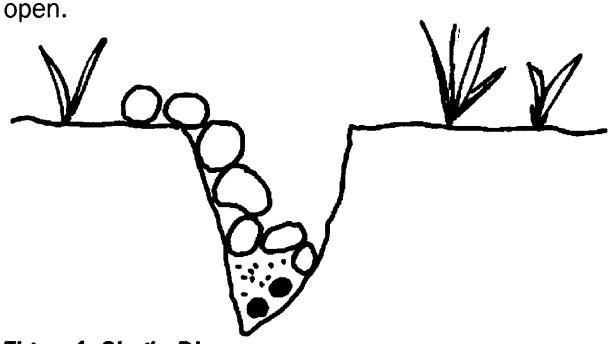


Figure4: Single Disc

Moderate disturbance with possibility of glazing of slot walls, often with clod and soil ribbon obstruction to seed germination or no cover at all.

Some of the disadvantages of the single disc opener are as follows:

- poor penetration in hard soil conditions.
- unable to slice through very heavy surface trash.
- often leave little or no soil cover over the seed.
- can dry the soil out by bringing moist soil to the surface.
- can "smear" the sides of the furrow in wet conditions.
- many moving parts.

Triple Disc and Twin Disc

These openers use multiple disc arrangements.

The triple disc uses a single disc at the front to cut through the trash and soil and 2 more discs behind, making a "V" shaped slot in the soil. The seed and fertiliser are dropped into this slot.

The twin disc simply has 2 discs which form a "V" shaped slot. It does not have a vertical disc at the front to help slice through surface trash.

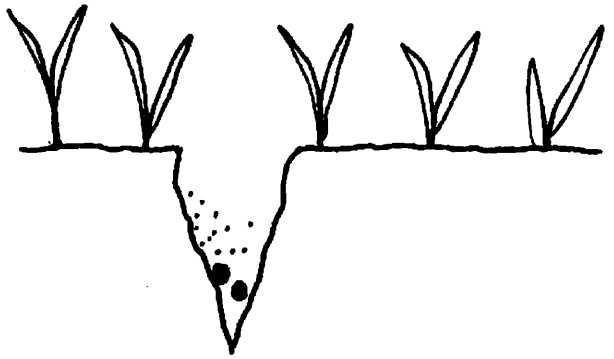


Figure 5: Triple or Twin Disc

Minimal disturbance with the possibility of glazing and compacting the slot wall which can inhibit seedling root development.

Agrowdrill Description & Application

Some of the disadvantages of these systems are as follows:

- easily block up with mud.
- many moving parts and expensive.
- cannot handle rocky conditions.
- tend to "smear" and "compact" the sides of the slot.
- do not always put the seed into loose soil.
- require a great deal of weight to penetrate the soil.

Conventional Tines

Conventional tined seeders mainly use a cultivating point which operates at a shallow angle to the soil. The action of the tine and the digging tool tends to lift the soil and throw it to both sides.

Few conventional seeders are fitted with coulters and consequently have difficulty handling the large amounts of surface trash often encountered when direct drilling. The action of the tine tends to drag trash along with it.

The disadvantage of conventional tines are as follows:

- poor trash handling ability.

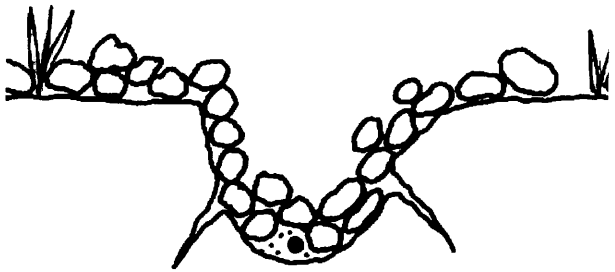


Figure 6: Conventional Tines
Loose, shattered soil structure with little ability to retain surface moisture or humidity around the seed in drying conditions.

- dry the soil with a wide furrow, exposing moist soil.
- often have poor accuracy placing the seed. Seed may end up near the surface, not in contact with moisture.
- have higher draft requirements due to the width of the digging point and the aggressive action of moving the soil up and to the side.
- the digging tools often have a high wear rate.
- the need for prior cultivation can damage soil structure.

The Agrowdrill Baker Boot opener overcomes the shortcomings of these alternative soil openers.

To gain the most benefit from the Agrowdrill you must think about seeding in a new way.

Seed Placement Important

Your aim when seeding must be to place the seed into the ground at the **right depth and achieve good seed to soil contact.**

What's happening under the surface where the seed must germinate is the most important thing.

Figure 7 illustrates what you should be trying to achieve, while Figure 8 shows undesirable results.

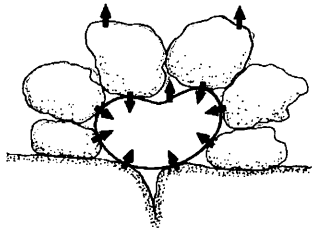


Figure 7: ***Correct seed to soil contact.***

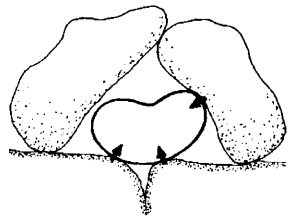


Figure 8: ***Incorrect seed to soil contact.***

Principles of Direct Drilling

1 Weed control

Good weed control is essential for successful establishment of a new pasture or crop.

Weed control is one of the main reasons for traditional cultivation practices - the ground engaging tool physically cut and tears the roots of unwanted plants from the soil.

Direct drilling calls for a different approach. Some of the alternatives available for weed control include:

- heavy grazing.
- spraying with herbicides.
- slashing.
- a combination of the above.

2 Timing

Timeliness of the seeding operation is critical for good germination, growth and best yield results.

There are two main aspects of timeliness you must consider:

- always check the optimum seeding date for your district and seed on time.
- ensure the best use of available moisture after rain by seeding while the soil is moist.

Agrowdrill Description & Application

3 Seed

Use only good quality certified seed. Certified seed is guaranteed to meet a minimum standard germination percentage; and to be free of weed seeds and impurities. Use the recommended seeding rate.

Your seed supplier or your local advisory officer can tell you how many kilograms per hectare (kg/ha) you should sow. Adequate plant population will also help your establishing crop or pasture compete with weeds.

Be sure to inoculate legume seed with the correct strain of Rhizobia bacteria. Failure to inoculate could lead to a poor pasture stand. Talk to your seed supplier about inoculation and ask them to supply the inoculant.

Your seed supplier will also be able to advise you about chemical protection of your seed for insect attach and various soil borne diseases.

4 Seed placement

Accurate seed placement is critical for successful germination. Seed should always be covered and in contact with moist soil. Seeding depth varies with species and is generally related to seed size.

Small seeds generally need to be placed shallow. The Agrowdrill is capable of placing seed accurately at any depth from a few millimtres down to 75mm (3"). Ask your seed supplier or advisory officer how deep you should be sowing and adjust the Agrowdrill accordingly.

The Agrowdrill can be set up to seed at various row spacings. Sowing row spacing can be either 127mm (5") rows, 175mm (7" rows) or any multiple of these.

If you are not using coulters, row spacing is infinitely adjustable. In some conditions it may be advantageous to seed in 127mm rows. e.g. Irrigated lucerne or ryegrass.

Other crops or pastures may call for wider spacings - e.g. sorghum at 350mm spacings. Consult your seed supplier or advisory officer for the correct spacing.

5 Ensure adequate plant nutrition

Most Australian soils are low in fertility and need to have nutrients added to boost pasture and crop growth. Young plants especially need good nutrition.

The need for fertiliser can be assessed in a number of ways:

- paddock history.
- the vigour of existing vegetation.
- chemical soil tests.
- trial plots.

Advice on fertiliser requirements can be sought from government advisory officers, agricultural consultants or fertiliser companies.

Below: Direct drilling to renovate pasture.

Fertilisers are available in many different forms and can be applied in many different ways. The Agrowdrill can "band" artificial fertilisers close to the seed and provide nutrition where it is most needed.

The Job's Not Finished at Seeding!

Careful preparation and seeding of a crop or pasture are only the first steps in the management process. There are a great deal of careful management practices needed after the Agrowdrill has given your seed the best chance of establishment. These include:

Weed Control

Effective weed control can be the difference between a profit and disaster. Good weed control before seeding will ensure emerging seedlings have a good start and an even better finish.

Certified seed, adequate fertility, correct seeding rates and placement of seed will put the odds in your favour for good germination and emergence.

The management practices after emergence, however, are just as important! Inspect your crop or pasture regularly for weed growth. If weeds become a problem you have a number of options open to you:

- use a selective herbicide to kill weeds.
- strategic grazing or slashing can help reduce weed growth.
- applying fertiliser may help in some situations.
- cutting hay can remove weeds.

Agrowdrill Description & Application

Insect Pest Control

Insect pests can seriously damage emerging or established crops and pastures. During your regular inspection you should also be on the lookout for insects. Consideration of the following points will help prevent or eliminate insects:

- grow species or varieties which are resistant to the common pests in your area.
- use treated seed.
- spray only if absolutely necessary.

Note: Information on chemical control of weeds and insects should be available from government advisory officers, agricultural consultants, chemical resellers or spraying contractors.

Use of Fertiliser

Maintaining good nutrition is important for sustained production.

All crops and pastures can benefit in some situations from additional fertiliser after seeding. Fertiliser can be added in many forms.

Grazing Management

New pastures usually stand only light grazing in the first season.

The following are some important points to remember:

- graze only when plants cannot be pulled out.
- graze heavily for SHORT periods to remove weeds.
- some species need to set seed each year, so allow this to take place.
- allow plenty of time for the pasture to recover after grazing.

Above: Inspecting seed placement of direct drilled oats using Baker Boots with coulters in kykuyu pasture.

AD95 Agrowdrill Specifications

AD95 Models		20	24	28	32
No of Sowing Rows*					
- 175mm (7") Spacing		20	24	28	32
- 127mm (5") Spacing		28	33	39	45
Sowing Width					
- 175mm (7")Spacing	(m)	3.5	4.3	4.9	5.6
	(ft)	(11' 6")	(14' 0")	(16' 3")	(18' 6")
Transport Width	(m)	5.0	5.75	6.5	7.25
	(ft)	(16' 6")	(19' 0")	(21' 3")	23' 6")
Hopper Capacity**		Large four box hopper capacity			
- Outside Boxes - each	(litres)	508	619	731	840
- Inside Boxes - each	(litres)	444	540	637	734
- Total Capacity	(litres)	1904	2318	2736	3148
(Seed Wheat)	(kg)	1428	1739	2052	2361
	(lb)	(3142)	(3825)	(4514)	(5194)
(Superphosphate)	(kg)	1904	2318	2736	3148
	(lb)	(2407)	(5100)	(6017)	(6926)
Unladen Weight	(kg)	2000	2180	2360	2540
(approx)	(lb)	(4400)	(4796)	(5192)	(5588)
Approx Drawbar kW Required		55	66	77	88
(direct drilling)	(hp)	(74)	(89)	(104)	(118)

Main Frame 5 Bar Five row frame constructed of 100 x 100 x 6 mm (4" x 4" x ¼") RHS with detachable hitch and moveable cross beams for tine spacing versatility. Optional sixth toolbar can be added to the front.

Hitch Trailed A-frame constructed of 75mm x 50mm (3" x 2") RHS with replaceable heavy duty hitch tongue and heavy duty adjustable third link with lock.

Hopper Constructed of 1.6mm hot rolled sheet steel to resist corrosion. Side panels constructed of 3.0mm hot rolled sheet steel. Seed and fertiliser distributors every 127mm (5") for complete versatility of sowing row spacing - minimum 127mm (5") or wider. Hopper bottom (vee sections) can be easily removed.

Sowing Mechanism (Seed & Fertiliser) Large 70mm (2 ¾") dia. 2 row fluted roller (fine and coarse seed). Made from glass filled nylon and finished to a non-stick, low friction surface. Blanking off caps available.

Transmission Infinitely variable speed transmissions with single lever controls for seed and fertiliser - oil bath, fully enclosed transmission housing. Infinite speed variation from zero to maximum rates with shift of single levers - single lever control of gate settings gives infinite variation of gate setting under distributors. This provides for varying seed sizes, flow rates and easy cleaning of hopper when wide open. Blanking off caps are used to close off one row of fluted distributors for finer seeds & lower sowing rates.

Underframe Clearance Standard Coil Tine 560mm (22")
700 Coil Tine 685mm (27")
Spring Release Tines 800mm (31½").

Maximum Working Depth Coulter models 75mm (3").

Coulters Plain or fluted 305mm (12") dia. standard
356mm (14") optional.

Transport Clearance 310mm (12 ¼") under tines

Tine Type All tines clamped to implement frame. Options of Standard Coil Tine, 700 Coil Tine or Spring Release Tine Assemblies.

Tine Breakaway Force Standard Coil Tine 177kg (390 lbf),
700 Coil Tine 145kg (320 lbf),
Spring Release Tine FC 324551 250kg (550 lbf),
Spring Release Tine FC 324650 295kg (650 lbf).

Max Tine Jump Height Standard and 700 Coil Tines 220mm (8½"),
Spring Release Tines 305mm (12").

No of Sowing Rows 5 sowing rows without coulters or 5 sowing rows using coulters with the sixth toolbar option.

Tine Spacing Sowing row spacing adjustable 125-380mm (5"-15").

Sowing Rates Infinetely variable rate adjustment.

Depth Control Two double acting series connected 89mm x 305mm (5" x 12") & 83mm x 305mm (4¾" x 12") phasing rams.

Wheel Equipment (2) 18.4 x 34 tractor tyres.

Optional Equipment Extension Stubs.
Standard Coil Tine (585mm u/frame clearnce).
700 Series Coil Tine (700mm u/frame clearance).
FC324551 Spring Release Tine - 550lbf breakout.
FC324650 Spring Release Tine - 650lbf breakout.
Single & Double Outlet Feed Cup.
2nd & 3rd Seed Tubes for Baker Boot.
Standard & Cast Baker Boots.
"Y" Tubes (2:1 outlet).
Rigid Swivel Coulters.
Sixth Toolbar.
Internal Lid Assemblies.
Moisture Skirts.
Fertiliser Screens.
Small Seeds Hopper.

** No of sowing rows can be increased by two with additional outrigger tines.*

*** Seed or fertiliser can be sown from any box compartment of the hoppers.*

Specifications are subject to change without prior notification.

Shipping Information & Assembly Instructions

Shipping Information

The following shipping information applies at the time of printing but variations can occur without prior notification.

AD95 Agrowdrill

Model	Approx Weight (kg):
20	2000
24	2180
28	2360
32	2540

Overall measurements for transport

Model	L x W x H (m)
20	5.0 x 3.1 x 1.7
24	5.75 x 3.1 x 1.7
28	6.5 x 3.1 x 1.7
32	7.25 x 3.1 x 1.7

Assembly Instructions

This section explains the assembly of the Agrowdrill after transit from the factory.

The AD-95 Agrowdrill is fully assembled, and fully checked at the factory.

When shipped, the Hectaremeter and A-frame hitch are disassembled and packed for tranport. The walkway may also be disassembled to meet transport width or height requirements.

A loading ramp or a crane with a lifting capacity of 5 tonnes is required for unloading the Agrowdrill.

Reassembly of the Agrowdrill on-site involves;

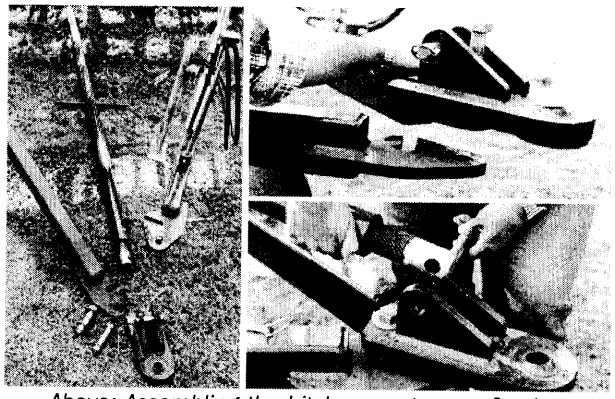
- Assembling and connecting the hitch.
- Connecting and priming the hydraulic lift circuit.
- Fitting the walkway (if disassembled).
- Installing the Hectaremeter.

To assemble the Agrowdrill, follow the steps given below:

1 Assemble the A-frame hitch

a) Assemble and attach the hitch.
Fit the main beams of the A-frame hitch to the Agrowdrill using the pins and clips provided. Use the hitch jack on the left hand beam to support the beam above the ground.

b) Fit the hitch tongue.
Place the hitch tongue on top of the left hand beam and align the both beams, upper and lower, using a bolt through the front hole. Then fit the bolt through the rear slotted hole, and fully tighten both bolts.

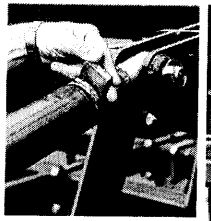


Above: Assembling the hitch arms, tongue & tube.

c) Fit the levelling tube.
First, fit the levelling tube (lock nut end) to the drill frame, and then, attach the tube to the hitch tongue end - using the pins and clips supplied.

d) Adjust the hitch level.
Adjust the hitch level to suit the tractor drawbar height. When level, make sure the levelling tube is locked using the lock nut.

e) Connect hitch to the tractor drawbar.



Above: Lock the levelling tube.

Right: Level the hitch to accomodate tractor drawbar height

Assembly Instructions

2 Connect and Prime the Hydraulic Lift Circuit

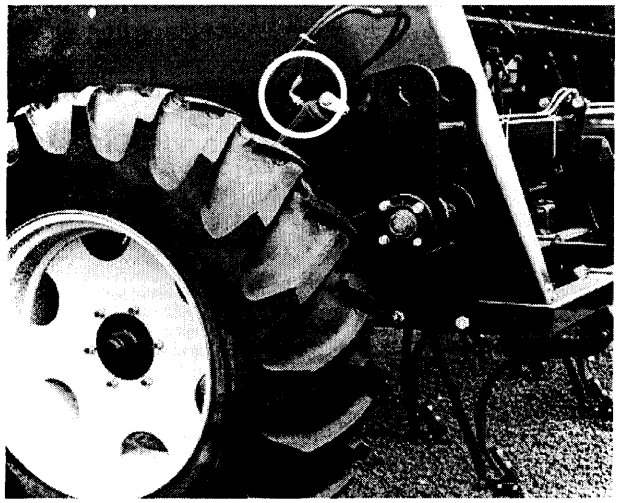
a) **Connect the hydraulic hoses** where the hitch connects to the Agrowdrill frame, and then connect the hoses to the tractor hydraulic outlets.

b) **Loosen the hydraulic connector** *(photo below)* on the hydraulic input line of the right hand wheel lift cylinder. This should be done to allow air to escape while the hydraulics are being primed from the tractor.

Note: If the input line is not released to bleed air, internal seals of the ram may be damaged and excess air will be forced into the tractor oil reservoir.

c) **Slowly pressurise the hydraulic lift hose** from the tractor until oil appears at the loosened connector on the right hand lift cylinder.

Below: Loosen the hydraulic connector on the hydraulic input line of the right hand wheel lift cylinder to allow air to escape while priming the lift circuit.



Note: Stand well clear of the released hose because oil under high pressure can spray wildly outwards. It is a good idea to place a hessian bag or similar material over the loosened outlet to minimise oil movement.

Note: As oil flows through the line and fills the left hand lift cylinder, the **left hand side of the Agrowdrill will become fully raised** before the right hand side.

d) **Retighten the hydraulic connector** on the right hand wheel lift cylinder as soon as oil appears.

e) **Continue to prime the lift circuit** until the right hand side lift cylinder is fully extended, and then hold the hydraulics open for another 15 to 30 seconds to allow all air to clear from the circuit.

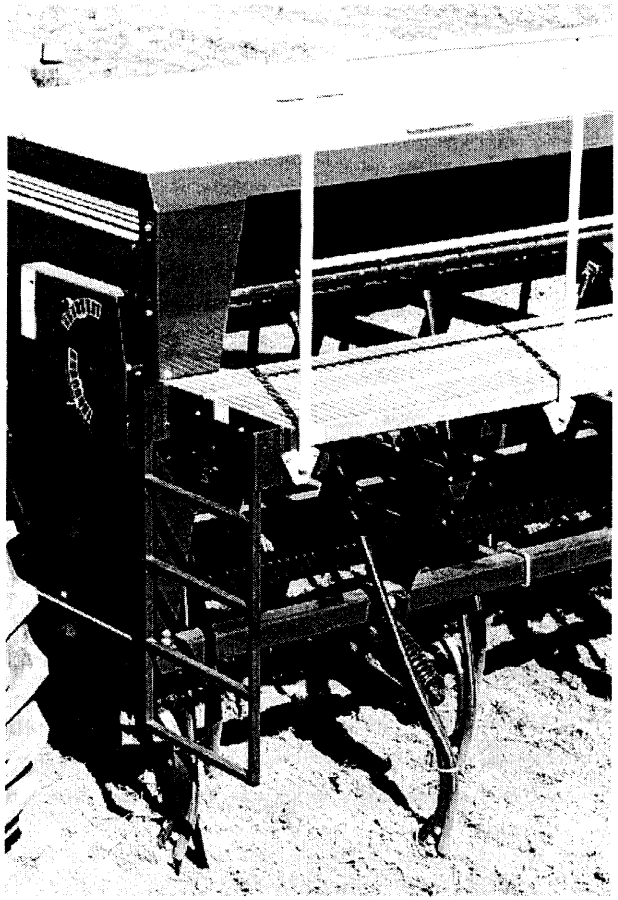
d) **Fully raise and lower the drill** several times to expel any trapped air.

The lift circuit is now fully primed and the Agrowdrill can now be moved. Unload or tow the unit off the truck at this point if using an unloading ramp.

3 Assemble the Walkway (if disassembled)

a) **Fit walkway support brackets.**
Fit the ladder bracket to the left hand side using the bolts provided. Fit the end bracket to the right hand side using the bolts provided. Fit the intermediate brackets using the bolts provided.

b) **Fit the the walkway beams.**
The first beam is placed at the rear of the brackets and interlocked as each beam is placed into positon towards the front.



Above: Walkway and ladder assembly.

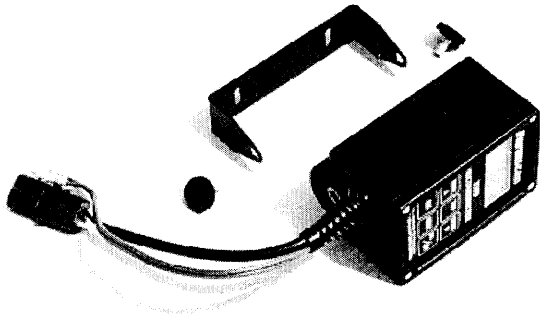
c) **Fit four Tek screws** to each end of the walkway to lock the walkway beams into position. Holes are provided in the end brackets for the Tek screws.

d) **Fit the safety rail** to the walkway using the bolts provided. When all bolts are in position, fully tighten them.

Assembly Instructions

4 Installation of the Hectaremeter

The electric 1100 Hectaremeter is designed to fit virtually any farm tractor. It displays and records area sown and displays working speed (kph).



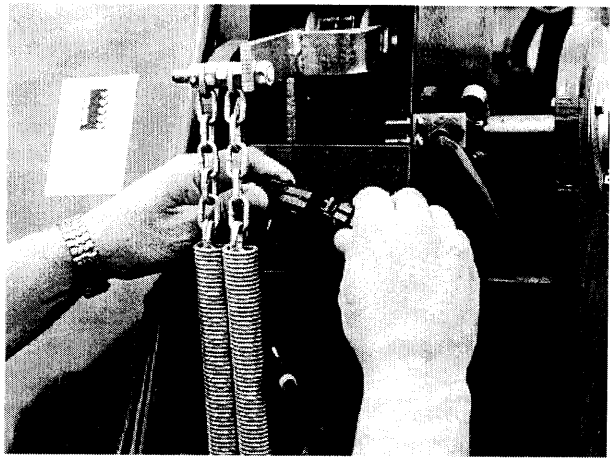
Above: Hectaremeter and fittings

a) Mount the Hectaremeter in the Tactor Cab.
Mount the control unit in a convenient location in the cab using the bracket and securing knobs supplied.

The unit is not waterproof and therefore must be installed in a tractor cab. It must be protected against moisture. Warranty will not cover moisture damage.

b) Connect and Secure the Cable from the Hectaremeter to the Shaft Sensor on the Agrowdrill.
The cable should be secured with cable ties along the Agrowdrill hitch and frame, away from any risk of damage such as lubricants and moving parts.

Important: Dust caps should be plugged together when the cable is in use, to ensure dust caps stay clean. Make sure dust caps are fitted when cable is not being used.



Above: Connect and secure the cable from the Hectaremeter to the Shaft Sensor on the Agrowdril

c) Power Connection
<u>Do not connect power</u> until all other installation is complete.

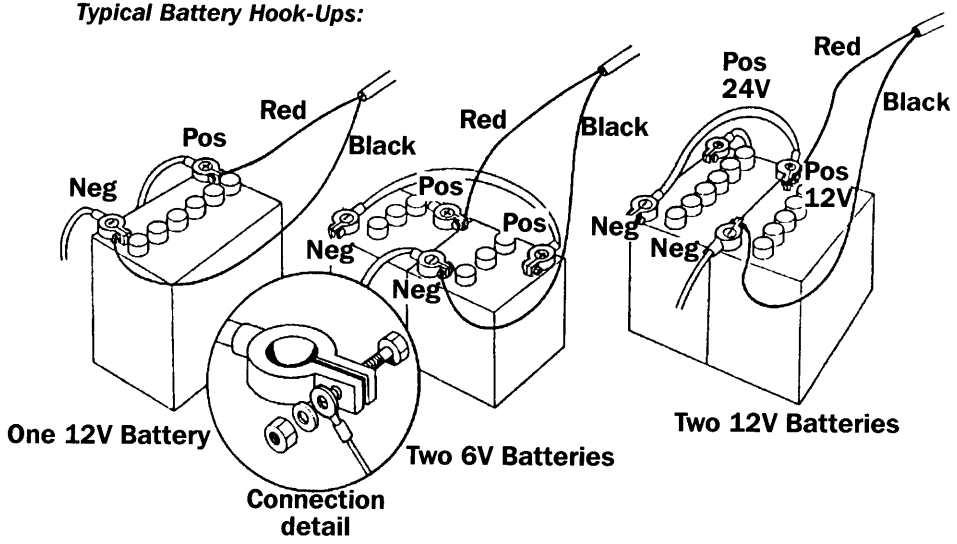
The 8 metre power cable must be connected DIRECTLY to the12 volt DC vehicle battery terminals. DO NOT join power cable with any other electrical equipment or the vehicle chassis, as this may cause interference.

Use cable ties supplied to secure power cable away from risk of damage.

Connection to battery terminals **must be clean and tight.**

WARNING: Disconnect power cable from battery when arc welding on machinery as damage to the unit will result.

Typical Battery Hook-Ups:



Calibrating Instructions

This section outlines the calibration procedures and operating information of the Hectaremeter. It also explains methods and procedures that can be used to check actual flow rates from the metering system for accurate adjustment of sowing rates.

After the Agrowdrill is fully assembled, the hectaremeter must be calibrated and the metering rates must be checked for each seed and fertliser used.

Warning: If calibration of the hectaremeter and checking of the metering system is not carefully done each season, then you will have little or no knowledge of sowing rates.

Calibrating the Hectaremeter

The hectaremeter must be calibrated to suit the width and distance the Agrowdrill travels per pulse from the wheel/shaft sensor.

The width and distance calibration factors are permanently stored in memory whenever the CAL routine is completed, as outline below.

Important: If calibration factors are corrupted due to outside interference, the readout will display HELP to show that calibration factors must be checked.

Entering Distance and Width Calibration Factors.
For easy calibration, Soil Care Systems provides the calibration factors required for each Agrowdrill model in a chart on page 34.

Follow the steps below:

1 Switch the Hectarementer ON.

2 Press the CAL key to display **H1 - the Distance Calibration Factor.**
Eg. H1
0000

3 Use the UP or Down arrow keys to set the distance calibraton factor (H) to the Pulse Distance (millimetres) shown on the chart for your Agrowdrill model.

Eg. 2557 (Refer to AD95 in the Pulse Rate column on page 34).

4 Press the CAL key again to confirm the previous setting and display **H2 - the Width Calibration Factor.**

5 Use the UP or Down arrow keys to set the width calibration factor to the width (metres) of your Agrowdrill model, shown on the chart.

Eg. 4.90 (refer to 28 run AD95 in the Sowing Width column on page 34).

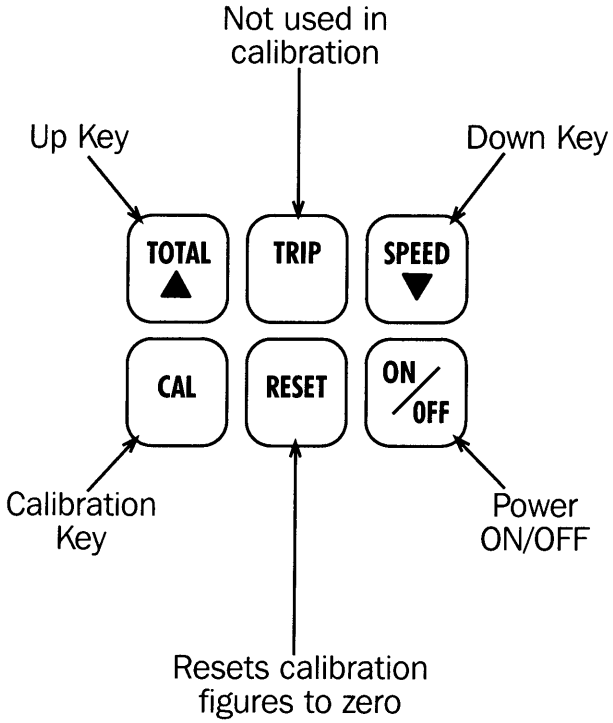
6 Press the CAL key again to confirm the width setting, store them in memory and exit the calibration cycle.

The Hectaremeter is now calibrated and can be switched OFF.

Note: To change the width factor for different implements, press CAL key twice to skip H1, and then change H2 using the UP/DOWN keys. Press CAL again to finish.

Calibrating Instructions

Below: Hectaremeter Calibration Functions



Operation of the Hectaremeter

ON/OFF KEY:
The ON/OFF key turns the Hectaremeter power ON or OFF.

Whenever the unit is switched ON the TOTAL hectares will be displayed first.
eg. 62.75 TOTAL HECTARES

From this point you can select any other key

TRIP KEY:
The trip key displays the TRIP hectares and works just like a car trip meter. You can reset the TRIP hectares for each paddock or load without losing the TOTAL hectares.

Maximum trip reading is 999.9 hectares.
Resolution is 00.00 to 99.99 then 100.1 to 999.9 hectares.

NOTE: With certain distance and width factors the display may appear to count incorrectly, skipping numbers. However, internally the display is calculating the exact area covered given the calibration factors entered and will not effect the accuracy of the meter.

TOTAL KEY:
The total key displays the TOTAL hectares which can be reset at any time, without losing TRIP hectares.

Maximum total reading is 9999 hectares.

RESET KEY:
Use the reset key to set TOTAL or TRIP hectares back to zero.

After selecting either TOTAL or TRIP hectares, hold the RESET key down for approx. 3 seconds to clear either readout back to zero.

SPEED KEY:
The speed key displays the working SPEED (KPH) at any time whilst travelling. eg. 12.6 KPH

MEMORY:
Both TOTAL and TRIP area readings are automatically stored in permanent memory - every 6 minutes of operation or when the unit is switched OFF using the ON/OFF key.

Note: The last 6 minutes of operation will be lost from memory if power is interrupted from source without first switching the unit off at the ON/OFF switch.

FLASHING DECIMAL POINT:
The decimal point on the display will flash for each pass of the magnet to indicate that the sensor is working.

With the magnet fitted to the drive shaft, the flashing decimal point may be used to indicate the shaft is engaged and turning.

Troubleshooting

For trouble shooting and other instructions for the hectaremeter, see pages 58-59.

Calibrating Instructions

Check Metering Rates

The gearbox or quadrant setting recommendations, given on the calibration charts for seed and fertiliser in this book, will not necessarily be accurate because large variations in seed sizes can exist from season to season and from crop to crop. Cleanliness of samples will also effect actual rates of seeding. This is especially true of oaten and some barley varieties.

For total seeding accuracy, it is recommended that you check the rate of flow from the Agrowdrill metering mechanism for each seed and fertiliser to be used.

This will provide very accurate rates of seeding, and can be recorded for future reference. You can plot your own seeding charts for future use.

Metering rates can be checked with the drill static or with the drill moving if it is important to more closely assimilate the ground conditions for sowing.

1 Static Methods of Checking Metering Rates

Our recommended static methods of checking metering rates use:

- An accurate set of electronic scales (accuracy to at least two grams). Most electronic kitchen scales will suffice.
- A small amount of seed and/or fertiliser.
- Five metering rows to test each sample.
- Small containers to collect the seed and/or fertiliser.

There are two static procedures outlined here. The **first is only for drills configured to 175mm (7") tine spacing, without extra tines and sowing on all tines.** The second is for drills configured to any other specification.

a) Standard Drills Configured to 175mm Row Spacing with All Tines Sowing

If your drill is configured to 175mm (7") row spacing as specified on the calibration chart on page 34, the procedure is as follows:

1 At one end of the hopper, place enough seed or fertiliser sample to cover five metering rollers to a depth of about 150mm (6"). A bag can be used to block and bank up the seed or fertiliser near the last roller inside the hopper.

   Two or more samples can be tested at one time by selecting other (separate) areas of other hoppers.

2 Set the Gate Settings required for your seed/and or fertiliser. Refer to the Gate Setting table on page 35.

3 Select a quadant settings for approximate sowing rate.

   Refer to the sowing charts given on pages 37-40 for a starting point.

4 Raise the drill so that tines are above the ground. Machines must be lifted high enough to disengage the ground drive mechanism.

Note: The lifted drill must be safely chocked up with solid blocks and/or stands so that it cannot drop down when adding or removing collection containers.

5 Place collection containers under the sowing tines being used for metering.

Danger Warning: Do not place any part of your body under the drill without first fixing the lifted drill with solid blocks and/or stands so that it cannot come down. Never rely on tractor hydraulics if you are placing any part of your body under the drill. Failure to do this may cause serious injury or death.

6 Using the crank handle provided, crank the metering drive shaft **anticlockwise** until seed and/or fertiliser is metering down each selected tube.

Note: It is important to ensure materials are being fed through the rollers before the test is run, otherwise a false reading will result.

7 Empty the initial seed and/or fertiliser samples from each container.

8 Crank the drive shaft **anticlockwise** X number of turns (where X is the number of turns shown on the calibration chart, on page 34 for your drill).

9 Weigh the collective samples with the electronic scales.

Note: Do not forget to subtract the weight of any container used to weigh the sample.

10 Establish the sowing rate in kg per hectare using the following formula:

   Kg/ha = Grams x Multiply By Factor (off chart)

   Eg. 327 gms x **0.28**

   = 91.54 kg per hectare.

Note: This formula is only applicable to a drill configured to 175mm (7") row spacing as specified on the chart.

Calibrating Instructions

11 Alter the gearbox quadrant setting (up or down as required) and repeat steps 8 - 10 until correct seeding rates are obtained.

Repeat procedure for other hoppers or materials being sown.

Note: If you do not have or wish to purchase a good set of electronic scales, it will be necessary to meter each sample through all hoses used across the width of the machine and for a greater number of turns. You must obtain sufficient quantity for a reasonable degree of accuracy with conventional scales.

b) Drills Configured to Any Other Specifications

If your drill is configured differently to the standard models outlined on the calibration chart on page 34, the procedure is as follows:

1 Follow the steps 1 to 7 of the previous section.

2 Calculate the distance to travel one hectare.

$$\textbf{Distance/1Ha} = \frac{\textbf{10,000}}{\textbf{Effectve Working Width (m)}}$$

Where:

Effective working width is the measured working width (outside tine to outside tine) plus one extra row spacing - expressed in metres.

Eg. 19 tines @ 250mm = 4.75m

$$\frac{10{,}000}{4.75} = 2105\text{m to cover 1 Ha}$$

3 Calculate the wheel revolutions required to cover one hectare:

$$\textbf{Wheel Revs/Ha} = \frac{\textbf{Distance/1 Ha (m)}}{\textbf{Wheel Circumference (m)}}$$

The wheel circumference of the AD95 is 5.01m

Eg. $\frac{2105}{5.01} = 420$ Wheel Revs/Ha

4 Calculate the idle shaft revolutions or crank revolutions per hectare:

Crank Revs/Ha =
Wheel Revs/Ha x Idle Shaft Ratio

The idle shaft ratio of the AD95 is 1.96.

Eg. 420 x 1.96 = 823.2 Crank Revs/Ha

5 **Convert the number crank revolutions required for 1 hectare into 1/50th of a hectare:**

$$\textbf{Crank Revs/1/50thHa} = \frac{\textbf{Crank Revs/Ha}}{\textbf{50}}$$

Eg. $\frac{823.2}{50} = 16.46$ **Crank Revolutions**

6 Crank the drive shaft X number of turns (where X is the "Crank Revolutions" calculated for your drill).

7 Weigh the collective samples with the electronic scales.

Note: Do not forget to subtract the weight of any container used to weigh the sample.

8 Now establish the sowing rate in kg per hectare using either of the following formula:

$$\textbf{Kg/Ha} = \frac{\textbf{Grams x MF x 50}}{\textbf{1000}}$$

Where:

- **Grams** is the metered material, eg 468gms.
- **MF** is a Multiplying Factor calculated by dividing the **total number of sowing tines by the number of tines used** for collection of materials.

Eg. 19 tines divide by 5 = 3.8.

Calculate example:

$$\frac{468\text{gms} \times 3.8 \times 50}{1000}$$

= 88.92 kg per hectare.

9 Alter the gearbox quadrant setting (up or down as required) and repeat steps 6 - 9 until correct seeding rates are obtained.

10 Repeat procedure for other hoppers or materials being sown.

Note: If you do not have or wish to purchase a good set of electronic scales, it will be necessary to meter each sample through all hoses used across the width of the machine and for a greater number of turns. You must obtain sufficient quantity for a reasonable degree of accuracy with conventional scales.

Calibrating Instructions

2 Dynamic Method of Checking Metering Rates of the Agrowdrill

This method of checking metering rates uses:

- An accurate set of electronic scales (accuracy to at least two grams). Most electronic kitchen scales will suffice.
- A small amount of seed and/or fertiliser.
- Five of six metering rows to test each sample.
- Small plastic bags and rubber rings to collect the seed and/or fertiliser from the feed cups as the drill is working.

The procedure is as follows:

1 At one end of the hopper, place enough seed or fertiliser sample to cover five metering rollers to a depth of about 150mm (6"). A bag can be used to block and bank up the seed or fertiliser near the last roller inside the hopper.

Two or more samples can be tested at a one time by selecting other (separate) areas of other hoppers.

2 Set the Gate Settings required for your seed/and or fertiliser. Refer to the Gate Setting table on page 35.

3 Select a quadant settings for approximate sowing rate.

Refer to the sowing charts given on pages 37-40 for a starting point.

4 Mark out a distance of 100 metres along typical country for test sowing.

5 Remove the sowing tubes each feed cap being used.

6 Using the crank handle provided, crank the metering drive shaft until seed and/or fertiliser meters out each feed cup. Alternatively, the drill can be move forward in sowing mode to meter the seed and/or fertiliser through to the cup.

Note: It is important to ensure materials are being fed through the rollers before the test is run, otherwise a false reading will result.

7 Fit and secure (using a rubber band) a plastic bag to the bottom of each feed cup.

8 Lower the drill into sowing position and travel the exact 100 metre distance at normal working speed and stop.

9 Weigh the collective samples with the electronic scales.

Note: Do not forget to subtract the weight of any container used to weigh the sample.

10 Calculate the Multipying Factor.
This is done by dividing the total number of sowing rows to be used on the drill by the number of rows used for the test run.

Total No of Sowing Rows ÷ No of Test Rows = Multiplying Factor

Eg. 28 ÷ 5 = 5.6

11 Calculate the Test Area Sown and convert it to a Test Area Factor using the following formula:

Distance travelled (m) x Width (m) = Test Area Sown

eg. 100 m x 4.9 m = 490 sq metres.

Divide the test area into one hectare (10,000m^2) to give the propotional factor for area.

10,000 ÷ Test Area = Area Factor

Eg. 10,000 ÷ 490 = 20.408

12 Now calculate the sowing rate using the collected Sample Weight (kg), the Multiplying Factor and the Area Factor.

Test Weight (kg) x Multiplying Factor x Area Factor = Sowing Rate Kg/Ha.

Eg. 0.8 x 5.6 x 20.408

= 91.42 kg/ha

13 Alter the gearbox quadrant settings (up or down as required) and repeat steps 7, 8, 9 & 13 until correct seeding rates are obtained.

14 Repeat procedure for other hoppers or materials being sown.

Note: If you do not have or wish to purchase a good set of electronic scales, it will be necessary to meter each sample through all hoses used across the width of the machine and for a greater working distance. You must obtain sufficient quantity for a reasonable degree of accuracy with conventional scales.

Research workers used the above method using electronic scales and all sowing rows to get exact seeding rate for trial plots.

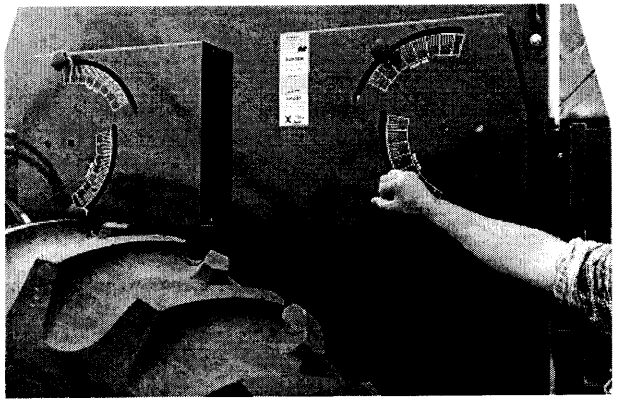
Calibrating Instructions

Calibration Data Chart

Use the **shaded columns** for quick calculation of seeding rates on standard Agrowdrills (refer pages 28-30)

Machine Type	Machine Size	No. of Rows (mm)	Row . Spacing (mm)	Sowing Width (m)	Wheel Rev/Ha.	Idle shaft Rev/Ha.	Distance to Travel 1 Ha. (m)	Pulse distance	No. of Collection Hoses	Turn Idler Shaft Revs	Multiply By Factor = kg / Ha
AD-95 Agrowdrill 7" Spacing with ½" drive chains	20 Row	20	175	3.5	570.25	1249.00	2857.25	2287	5	25.00	0.20
	24 Row	24	175	4.2	475.25	1041.00	2381.00	2287	5	20.75	0.24
	28 Row	28	175	4.9	407.50	892.50	2040.75	2287	5	17.75	0.28
	32 Row	32	175	5.6	356.50	781.00	1785.75	2287	5	15.50	0.32
	36 Row	36	175	6.3	317.00	694.50	1587.25	2287	5	14.00	0.36
AD-95 Agrowdrill 7" Spacing with 5/8" drive chains	20 Row	20	175	3.5	570.25	1117.25	2857.14	2557	5	22.50	0.20
	24 Row	24	175	4.2	475.25	931.00	2380.95	2557	5	18.75	0.24
	28 Row	28	175	4.9	407.50	798.25	2040.82	2557	5	16.00	0.28
	32 Row	32	175	5.6	356.50	698.50	1785.71	2557	5	14.00	0.32
	36 Row	36	175	6.3	317.00	621.00	1587.30	2557	5	12.50	0.36

Calibrating Instructions



Adjusting the Seed and Fertiliser Rates

Adjusting the seed and fertiliser rates on the Agrowdrill is very simple.

Adjustment involves three components:
1 Varibox Gearboxes (refer to Figures 9 & 10).
2 Restrictors applied to the fluted rollers (refer to Figure 12).
3 Adjustable Gates under the fluted rollers (refer to Figure 12).

All three may need to be adjusted.

1 Gearbox Adjustments

Agrowdrills unique gearbox allows adjustment of seed and fertiliser rates over a wide range by simply adjusting one lever for each.

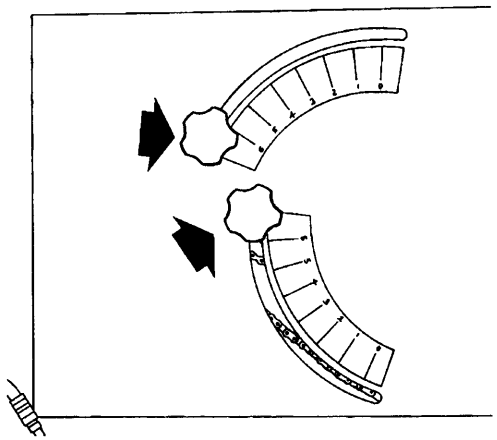
The levers are on the left side of the machine. The top lever adjusts the front hopper and the bottom lever adjusts the rear.

Use the following procedure to set rates:

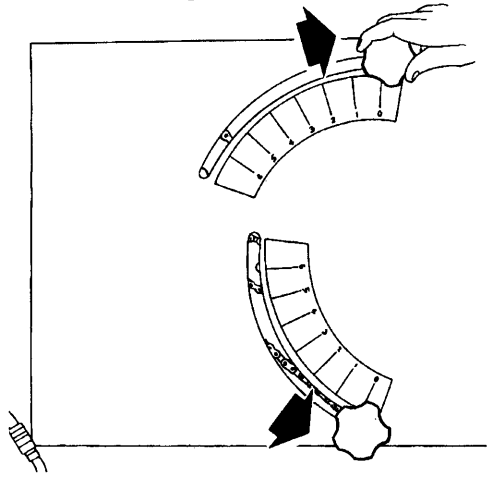
a) Look up seed and fertiliser rates charts on pages 37-40.

c) Loosen each knurled knob (see figure 9 or 10), set the levers to the recommended positions and retighten firmly.

Below: Figure 9 - Maximum Rates



Below: Figure 10 - Minimum Rates



2 Restrictors

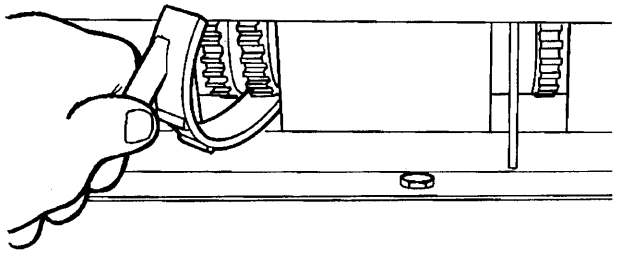
The "Fluted" metering rollers (identical for both seed and fertiliser) have a coarse and fine side (see figure 11).

This design allows large and small seeds to be accurately metered. The Agrowdrill can handle a wide range of seed sizes with the minimal adjustment of fitting or removing a restrictor cap.

Check for recommended **Gate Settings** and **Restrictor Settings** on the table below:

Seed	Gate Setting	Restrictors Fitted
Lupins	3	No
Oats	3	No
Wheat	2	No
Canola	1	Yes coarse side
Sub Clover	1	Yes coarse side
Lucerne	1	Yes coarse side
Sorghum	1	Yes coarse side
Single Super	2	No
Urea (high analysis)	1.5	No

Below: Figure 11 - Fitting Restrictor Caps



Use the following procedure to select fine or coarse sides of the fluted rollers as required:

a) Grasp the rear arm of the blanking cap and twist to release it from under the rear ledge and remove. (See figure 11 on page 35).

b) Reinsert the cap into the recommended side of the roller or leave out (as applicable).

c) Repeat the process for all rollers.

3 Gate Settings

In most circumstances you will not need to open the gate settings. The gate may need to be opened to meter very large seeds.

Adjust as follows:

a) Check the gate setting recommendation for the seed or fertiliser being used (refer to the table on page 35, or the sowing rate charts on pages 37-40).

b) Loosen the knurled knob (see figure 12), set the adjusting lever to the recommended position and retighten.

Note: The gates can be opened for cleaning the hoppers. Be sure to reset the gates after cleaning.

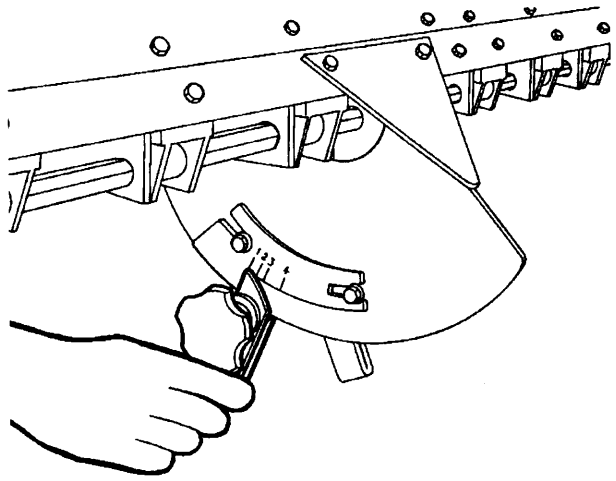


Figure 12 - Adjusting Gate Settings

PLEASE NOTE:
Sowing charts are to be used as a guide only.

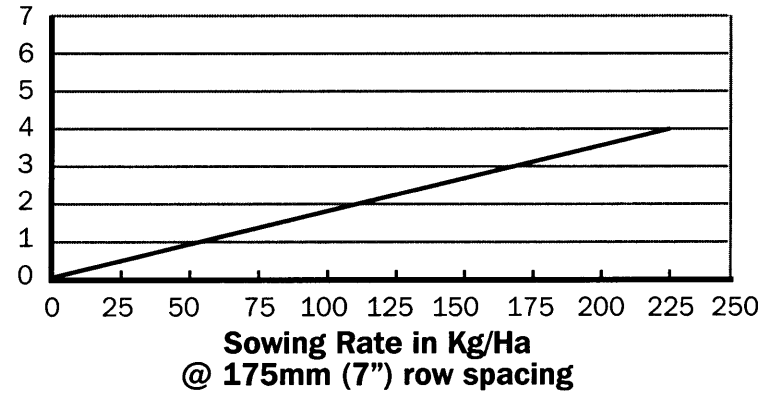
Rates should be verified by calibration.

Metered quantities can vary depending on type of seed or fertiliser and variety thereof.

Sowing Charts

WHEAT

Quadrant Setting — Agrowdrill Varibox Sowing Rates

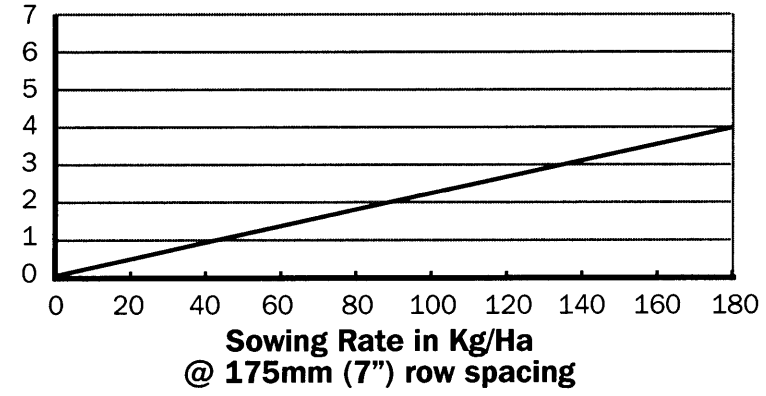


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 2 / No Restrictors

LUPINS

Quadrant Setting — Agrowdrill Varibox Sowing Rates

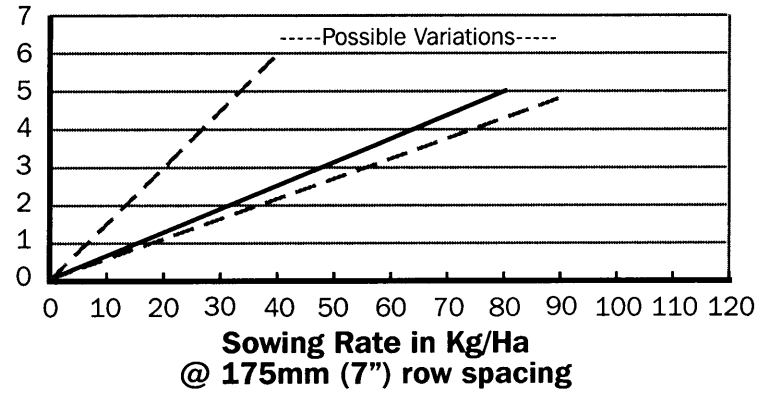


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 3 / No Restrictors

OATS

Quadrant Setting — Agrowdrill Varibox Sowing Rates

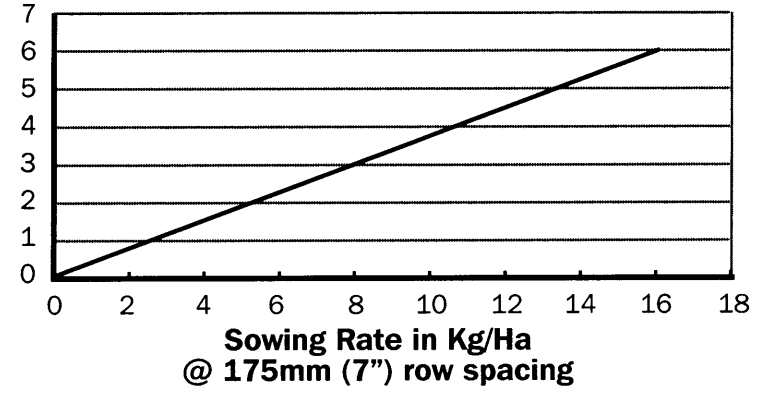


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 3 / No Restrictors

RYEGRASS

Quadrant Setting — Agrowdrill Varibox Sowing Rates



Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

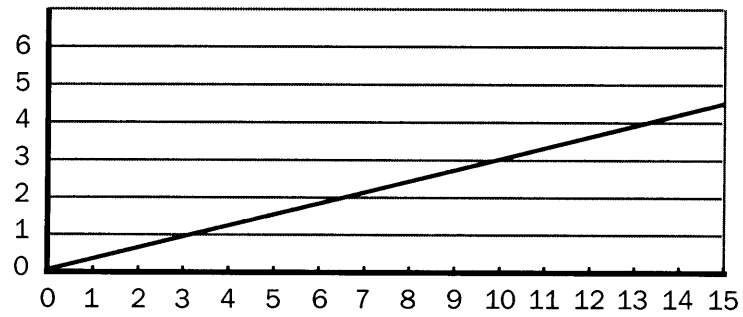
Gate Setting 1 / Restrictors Fitted

Sowing Charts

LUCERNE

Quadrant Setting

Agrowdrill Varibox Sowing Rates



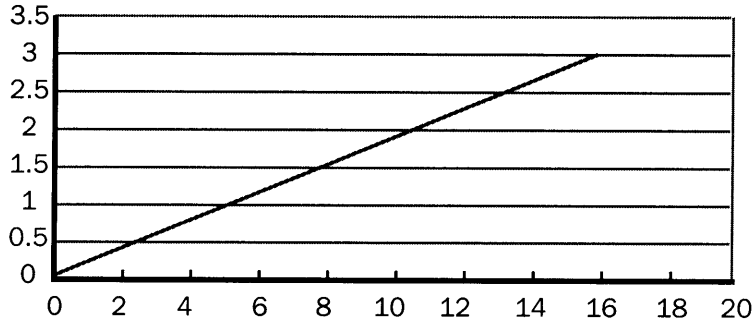
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 1 / Restrictors Fitted

CANOLA

Quadrant Setting

Agrowdrill Varibox Sowing Rates



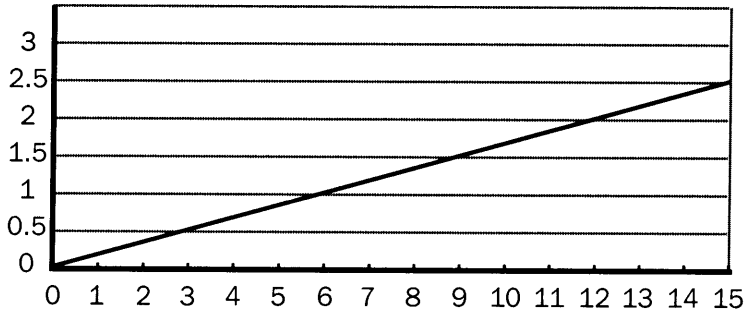
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting .75 / Restrictors FITTED

SUB CLOVER

Quadrant Setting

Agrowdrill Varibox Sowing Rates



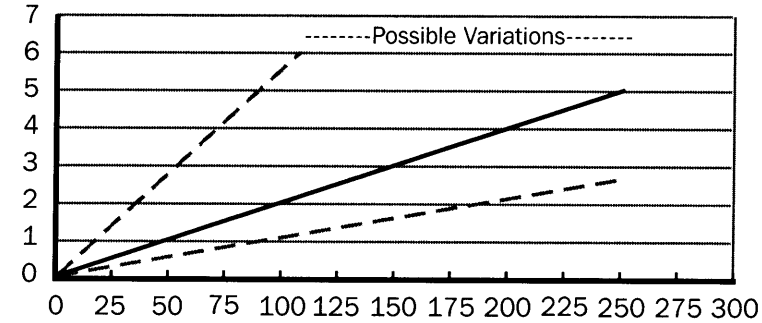
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 1 / Restrictors Fitted

SINGLE SUPER

Quadrant Setting

Agrowdrill Varibox Sowing Rates



Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

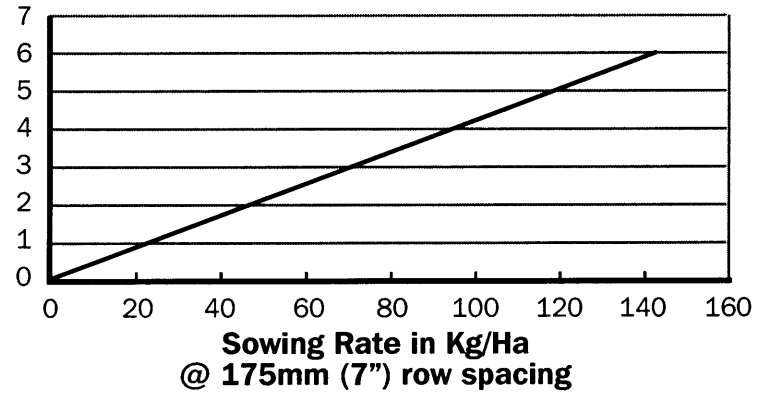
Gate Setting 2 / No Restrictors

Sowing Charts

D.A.P. (High Analysis Only)

Quadrant Setting

Agrowdrill Varibox Sowing Rates



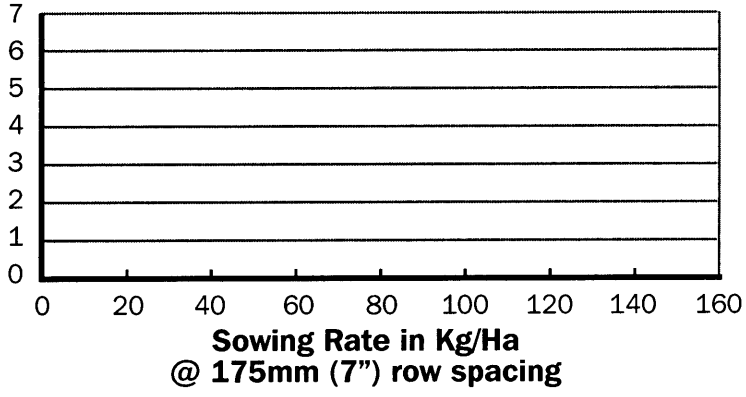
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 1.5 / No Restrictors

.....

Quadrant Setting

Agrowdrill Varibox Sowing Rates



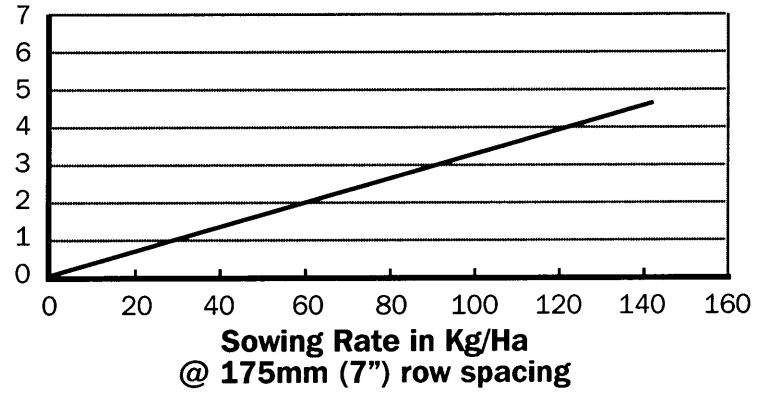
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

UREA

Quadrant Setting

Agrowdrill Varibox Sowing Rates



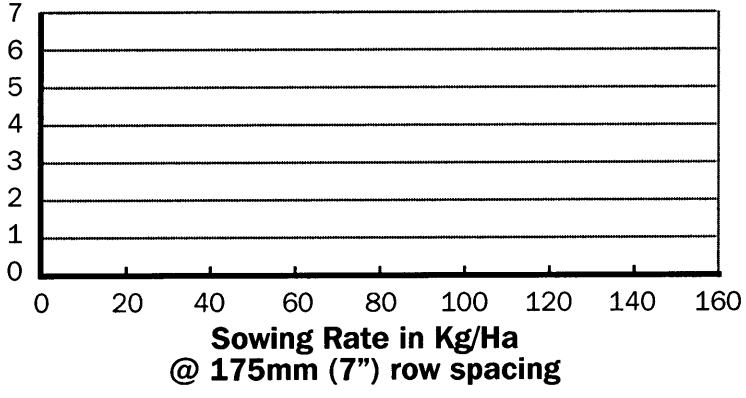
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting 1.5 / No Restrictors

.....

Quadrant Setting

Agrowdrill Varibox Sowing Rates



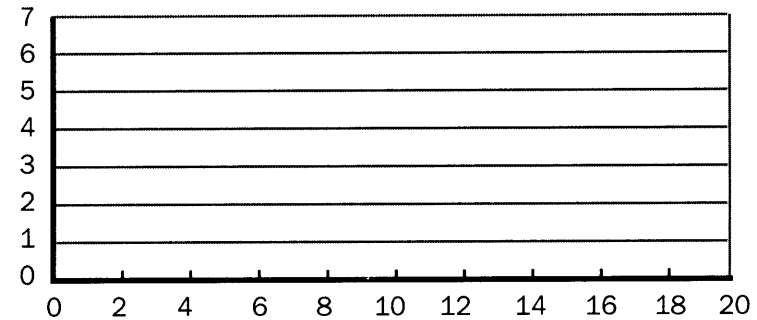
Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

Sowing Charts

Quadrant Setting

Agrowdrill Varibox Sowing Rates

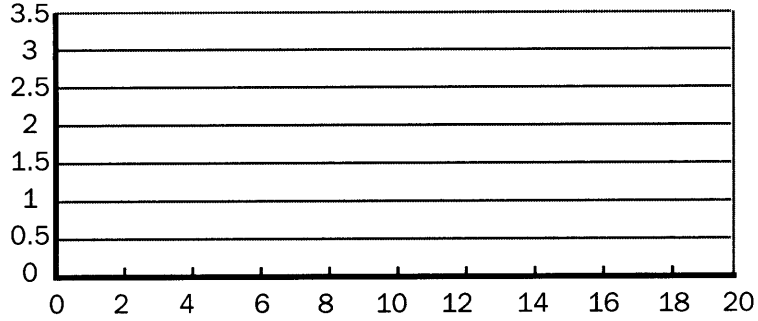


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

Quadrant Setting

Agrowdrill Varibox Sowing Rates

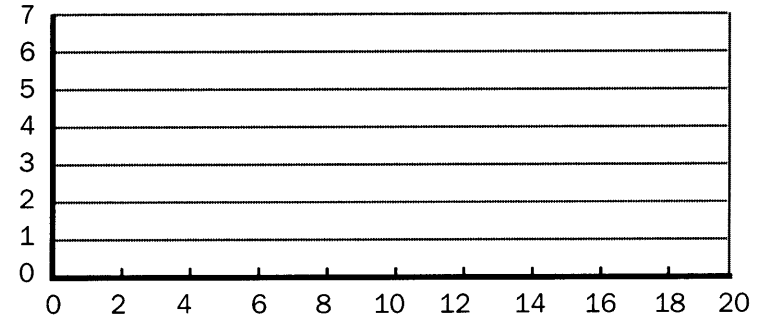


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

Quadrant Setting

Agrowdrill Varibox Sowing Rates

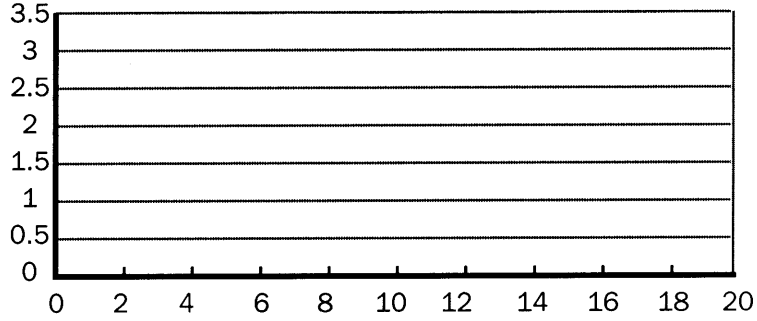


Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

Quadrant Setting

Agrowdrill Varibox Sowing Rates



Sowing Rate in Kg/Ha
@ 175mm (7") row spacing

Gate Setting ..... / Restrictors .....

Operating Instructions

Before You Start...

The Agrowdrill should be matched to your tractor size to maximise performance and efficiency. A mismatched tractor and implement will be inefficient and cost you money, as well as being unsafe.

Hitching and Levelling

Hitching and levelling procedure is as follows:

a) Pin the tractor drawbar into the central position.

b) Attach the Agrowdrill to the drawbar and set the adjustable top link so that the machine is approximately level.

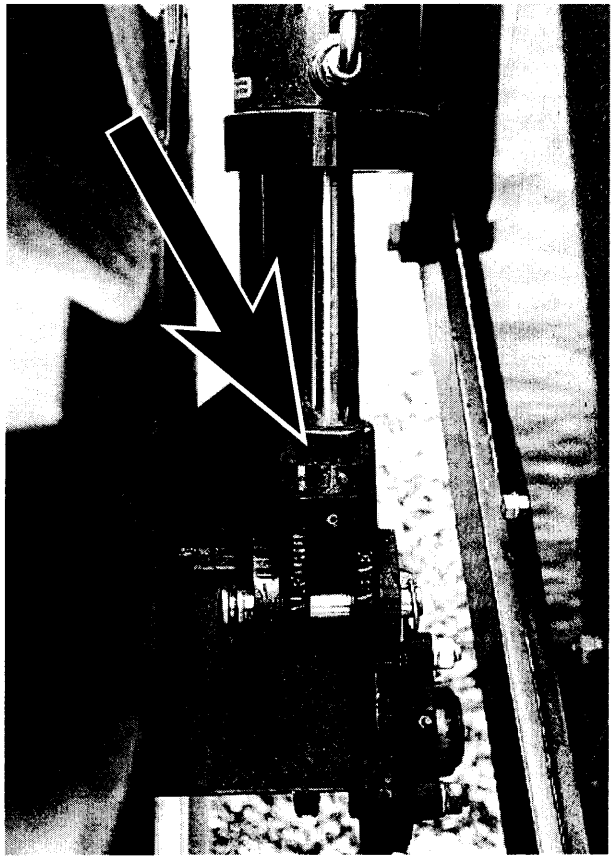
Warning! Ensure the drawbar pin is locked into position so that it cannot work itself out when the machine is in operation or transit. Failure to do this may result in serious injury or death.

c) Attach the hydraulic coupling to your tractors remote outlet, taking care to clean away any dirt.

The working depth of a trailing Agrowdrill is controlled by hydraulic rams attached to the wheel assemblies. These are operated by the remote hydraulic system.

On some tractors it is necessary to set the hydraulic system to operate in "single acting" or "bypass" mode. Consult your tractor operator manual or dealer for details.

d) Lift the machine to the highest position. This will fully extend both hydraulic rams and ensure they are "phased" properly.



Above: Adjust the depth collars fitted to the end of each hydraulic ram to the maximum desired depth.

e) Adjust the depth collars fitted to the end of each hydraulic ram to the maximum desired depth. These stops will ensure positive depth control (See photo).

Note: Both depth stops must be adjusted equally and both tyre pressures must be correct to established even working depth.

f) Start working at the desired depth and observe the level of the machine from **the side and the rear.** Adjust the top link on the hitch "A" frame so that your Agrowdrill is level from front to rear. **Front and rear depth of sowing tines must be equal.**

Retighten the locking collar on the top link when you have finished adjustments.

Note: It is very important that you level your Agrowdrill correctly to achieve good results.

As a final check on the levelling, dig to the bottom of the furrow at 2 to 3 points across the width of the machine and check the seeding depth.

Ensure that the front and rear tines are seeding at the same depth.

Tyre Pressures

On both linkage and trailing models, check that tyres are properly inflated.

Correct inflation pressures is:

- All AD95 models - 250 to 285kPa (35-40 psi).

Beware of uneven pressures because a low inflated tyre will allow one side of the machine to dig deeper.

Operating Instructions

Seeding Depth

Seeding depth will vary depending on the species being sown. Generally speaking, small seeded species have less vigorous seedlings and should be placed shallower. Larger seeded species usually have more vigorous seedlings and can emerge if placed deeper.

The following are important guidelines:

- seed should always be placed into and covered with moist soil. If it is not possible to find moist soil without seeding too deeply, consider waiting for rain or irrigating.
- seeding deeper than recommended will drastically reduce your chances of good germination and emergence.
- in hot, dry conditions the top soil will tend to dry out rapidly and lead to poor germination.
- in wet, cool conditions the topsoil will remain moist, and shallow placed seed will germinate effectively.

Ask your seed reseller or Advisory Officer for a recommendation, if you are unsure about seeding depth.

Row Spacings

Row spacing is infinitely adjustable. In some conditions it may be advantageous to seed in 127mm rows. e.g. Irrigated lucerne or ryegrass.

Other crops or pastures may call for wider spacings, e.g. sorghum at 350mm spacings. Consult your seed supplier or advisory officer for the correct spacing.

The Agrowdrill can be set up as either two rows or three rows of seeding tines, with or without coulters.

The AD95 model of the Agrowdrill can be set up as either five rows or six rows of seeding tines, with or without coulters.

Using the Agrowdrill as a six row machine allows greater clearance between the tines in conditions where you don't need to use coulters.

There is no restriciton to row spacing. The only restriciton is the maximum number of outlets available on the machine's sowing mechanism.

Possible maximum number are:
28 row 33 row 39 row 45 row

Consult your Agrowplow dealer for the tine layout options and details.

Optional Tool Bar

An additional bolt-on tool bar is available to increase the number of tines available.

Consult your Agrowplow dealer for options and details.

Operating Instructions

Coulter Settings and Adjustment Procedure (If Fitted)

Coulters must be adjusted **to run exactly in front of the soil opener** whilst the machine is operating. If the coulter is running off line the soil will not be sliced correctly leading to trash build up and greater surface disturbance.

The Agrowdrill is factory set with standard 175mm spacings and the coulters are adjusted to suit. Use the following procedure if the Agrowdrill requires adjustment:

a) Position the Agrowdrill with the tines and coulters resting on a hard surface such as a cement floor.

b) Observe the coulters and tines, noting any misalignments of coulters and tines, and coulter depth settings.

c) Lift the Agrowdrill and make any necessary adjustments to tines and/or coulters. Use the procedure outlined in the previous section.

Danger Warning: Do not place any part of your body under the drill without first fixing the lifted drill with solid blocks and/or stands so that it cannot come down. Never rely on tractor hydraulics if you are placing any part of your body under the drill. Failure to do this may cause serious injury or death.

d) Lower the machine, recheck alignment and retighten clamping bolts.

e) Recheck tine and coulter clamp bolt tensions after approximately 30 minutes operation.

Note: The Agrowdrill is supplied standard with 305mm (12") diameter coulters.

See the Maintenance Section (page 50) for coulter replacement procedure.

The Agrowdrill can be equipped with either "plain" or "fluted" coulters. The advantages and disadvantages of each are as follows:

Plain Coulters:
- used where best appearance of the finished job is desired.
- used in harder soil where maximum penetration is desired.
- lower wear rate than fluted coulters.

Fluted Coulters:
- perform better in very heavy trash conditions.
- more effective in clay type soils, causing less smearing.
- more aggressive surface disturbance.

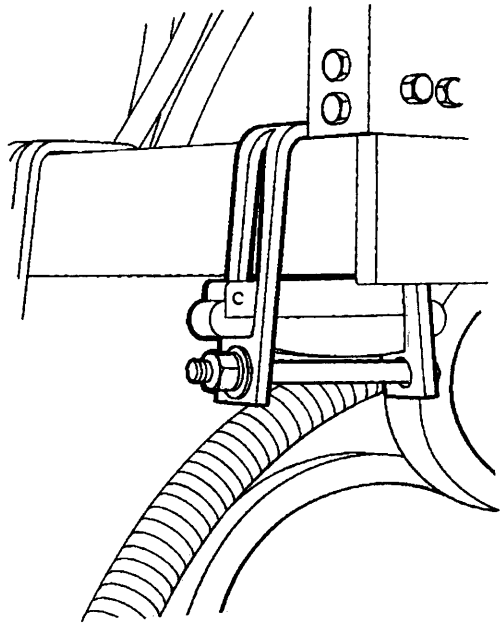
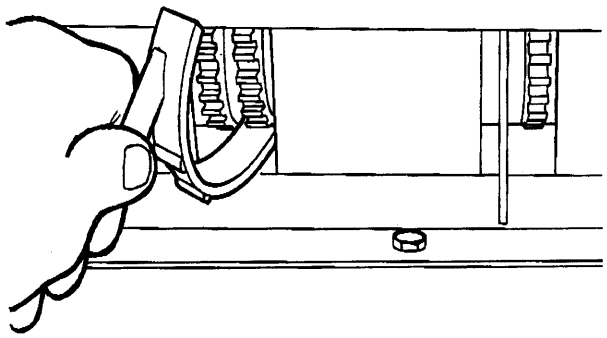


Figure 13 - Coil tine clamp assembly.

Figure 14: Removing & installing blanking off caps



Operating Instructions

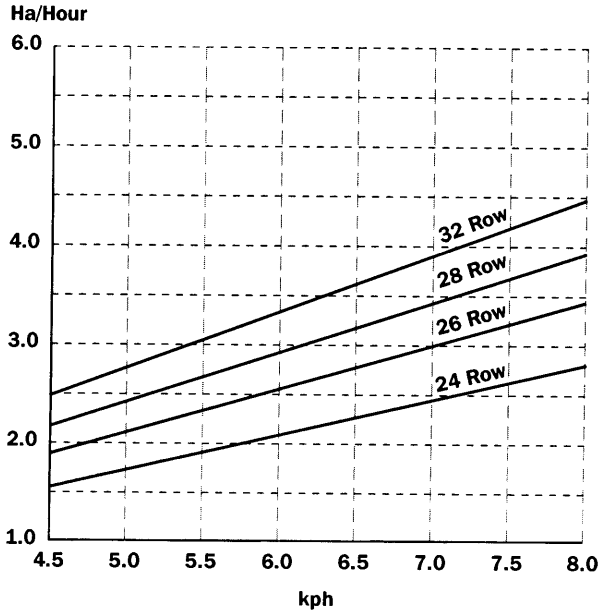
Operating Speed

The Agrowdrill will produce the best results if operated between 4 & 8 kph (3 - 5 mph) when direct drilling with Baker Points. Optimum speed varies with soil type, vegetative cover and root matter present.

If operating too fast, increased and undesirable surface disturbance, reduced penetration and reduced the accuracy of seed placement may occur.

Higher speeds increases wear on the soil openers.

The graph below shows work rates in Ha/Hour which you can expect to achieve with an Agrowdrill.



Graph showing Agrowdrill model, speed and work rate

Which Hopper Should You Use for Seed?

The metering system in all hoppers are identical. You can use seed or fertiliser as you wish. We generally recommend that the very front and rear hoppers be used for fertiliser and the centre hoppers for grain.

Consider the following points when deciding which to use:

- For the majority of seeding jobs you will be using a greater quantity of fertiliser than seed. The very front and rear hoppers have larger capacity and therefore will give you greater efficiency.

- Fertiliser is generally denser than seed. Putting the fertiliser in the very front hopper will bring the Agrowdrill's centre of gravity forward.

Operating Tips!

The following are some of the problems you may encounter during operation of the Agrowdrill.

1 Incorrect Seed or Fertiliser Rates.

You may find that the seed and fertiliser does not run through at the recommended rates show on the chart of this book. This is quite normal and is due to differences in grain sizes or treatments used.

Always check the metering flow rate of your seed and fertiliser before you begin seeding. Refer to the section "Check the Flow Rates of the Metering Mechanism" outlined on pages 31-33.
You can use the following procedure to "check and fine tune" the Agrowdrill settings when seeding:

a) Fill the hopper to the top and level the seed and fertiliser.

b) Commence seeding and work until the hoppers are more than half empty.

c) Refill the hoppers taking careful note of the amount added.

d) Note the number of Hectares indicated on the Hectaremeter and calculate the actual sowing rates using the following formula:

$$\textbf{Kg/Ha application rate} = \frac{\textbf{Kilograms of seed or fertiliser used}}{\textbf{Hectares seeded}}$$

e) If necessary, adjust the rates up or down as required.

2 Calibrating the Agrowdrill for a seed or fertiliser not listed

Rates for most common seeds are listed in the graphs on the preceding pages. If the seed you wish to sow is not listed you will need to calibrate the Agrowdrill.

Use the procedures outlined under Static or Dynamic Methods of Checking Metering Rates of the Agrowdrill on pages 31-33, to establish a reliable sowing rate for seeds and fertilisers not listed.

3 Plotting your own calibration charts.

The procedure outlined above will allow you to draw up your own calibration charts using the blank charts included on pages 39-40 of this manual.

You can also modify existing graphs if they are not accurate for your seeds and fertilisers.

The procedure is as follows:

a) Set the Varibox Adjusting Lever to the maximum setting (7) and carry out steps one (1) to seven (7) as outlined in the previous section.

b) Select one of the blank charts on pages 39-40 which best suits the seeding rate you are achieving. These charts have a number of calibrations, allowing for light and heavy seeding rates.

c) Find the point using the numbers on the **bottom line** of the graph which corresponds with the sowing rate from the Agrowdrill.

d) Mark a point on the **topline** which corresponds to the quadrant setting seven (7).

e) Draw a straight line from the **bottom left hand corner** of the chart to the point you marked on the top line.

   This line indicates the approximate amount of the seed or fertiliser which will be sown at any given Quadrant setting.

4 Gradual Slowing of Fertiliser Flow

This often happens when using fertilisers such as Single Super which have a high percentage of fine powder. The powder gradually builds up in the bottom of the fertiliser hopper and slows the flow rate.

Thes may also occur with lime coated seeds because the lime is prone to flake off.

To avoid this problem, occasionally run the fertiliser hopper to a low level and clear away any powder build-up manually, by opening the gate settings to the widest setting. Only do this while the machine is stationary.

5 Metering System Seized

This can easily happen if you are using fertilisers which are highly soluble and corrosive. eg. Urea.

Such fertilisers will "cake" rapidly in moist conditions and may seize the fluted rollers. This can be avoided by **never leaving the Agrowdrill filled with fertiliser in moist conditions.**

6 Checking the Rotation of the Drives

Before you begin the day's seeding you can easily check the rotation of the seed and fertiliser metering systems by "ratcheting" the adjustment levers (see figure 9 & 10 on page 35).

Simply loosen the knurled knobs and move the levers backwards and forward a number of times. This will rotate the drives.

This allows you to do the following:

- Check if the metering system is seized with caked fertiliser.
- Free small blockages caused by caked fertiliser. If the caking is severe you may need to clean out the fertiliser hopper manually.
- Check for blockages in the fluted rollers, downtubes or soil openers. You should observe a quantity of seed and fertiliser under each soil opener.

After the First Round

The following is a list of points you should check after the first pass or round of a paddock.

a) Ensure both the seed and fertiliser drives are rotating.

Note: Problems in this area can be avoided with adequate maintenance and checking the rotation of the drives before commencing.

b) Check that seed and fertiliser are running evenly through all rows.

c) Ensure that the bottoms of the tubes are not blocking up with wet soil. If this occurs you should allow the soil to dry out further before continuing.

d) Check the soil openers for loose bolts.

e) Check the rotation of coulters.

f) Check the machine for any loose bolts.

g) Check the alignment of the coulters and openers.

h) Retension all tine and coulter clamps.

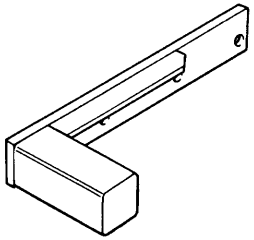
Note: Never turn a sharp corner with a coulter equipped Agrowdrill engaged in the soil.

Optional Equipment

1 Extension Stubs

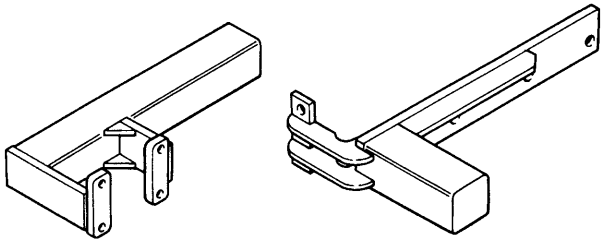
Extension stubs are available for coil tines.

Below: Extension stub for coil tines.

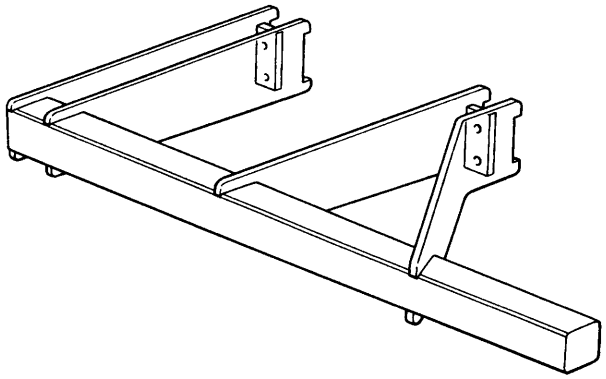


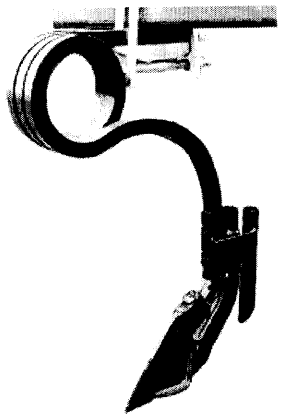
Heavy duty front and rear extension stubs are available and are suited to the strong spring release tines with 650 lbf breakout.

Below: Front extension stubs.



Below: Rear extension stubs.





Above: 700 Series Tine & Fittings.

Above: FC324551 Spring Release Tine and Fittings.

2 Standard Coil Tine

The standard coil tine gives 585mm underframe clearnce and 177kg (390 lbf) tine breakout force. it requires adapters to fit various ground engaging tools.

3 700 Series Coil Tine

The new longer coil tine gives 700mm underframe clearance and 145kg (320 lbf) tine breakout force.

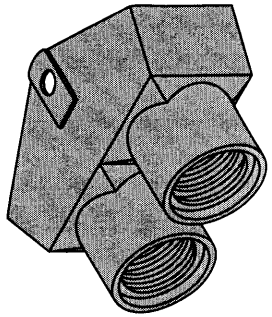
It features a new one hole, angled foot design which allows a wide variety of Primary Sales ground engaging tools to be used.

The longer tine and new foot design provides greater trash clearance.

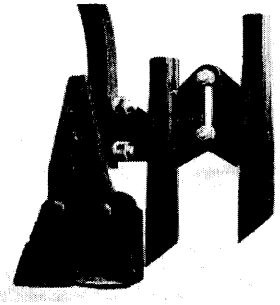
4 FC324551 Spring Release Tine

This conventional spring release tine gives 250kg (550lbf) tine breakout force.

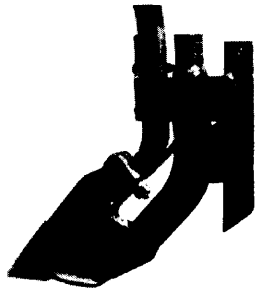
Double Outlet Feed Cup Option



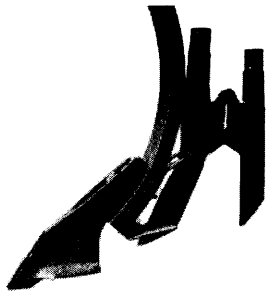
Second Seed Tube Option for standard coil tine & standard Baker Boot



Second Seed Tube Option for 700 Series coil tine & Cast Baker Boot



Second Seed Tube Option for FC324551 Spring Release Tine & Cast Baker Boot



Optional Equipment

5 FC324650 Spring Release Tine

This conventional spring release tine gives 295kg (650lbf) tine breakout force.

6 Single Outlet Feed Cup

The single cup meters each box into one sowing tube.

7 Double Outlet Feed Cup

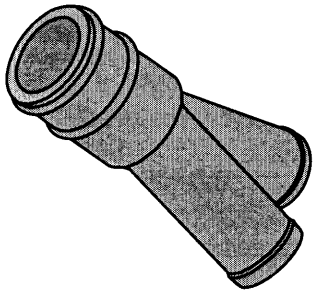
The double cup option allows each box to meter into separate sowing tubes. It can be used in deep banding, side dressing, predrilling, inter-row sowing, split function and other sowing applications

8 Second Seed Tubes for Baker Boot

Second seed tube options are available for fitting to the rear of the Baker Boots for split sowing applications - for each tine type.

9 Third Seed Tube for Baker Boot

Third seed tube options are available for fitting to the rear of the Baker Boots for split sowing applications - for each tine type.



"Y" Tube Option

10 Standard Baker Boots

The standard Baker Boot is manufactured from hard wearing bisalloy steel. It is fitted with tungsten on the digging tip.

11 Cast Baker Boots

The use of these cast Baker Boot opener is recommended where very high wear rates are a problem. These openers are slightly thicker than standard openers and are fitted with tungsten on the digging tip.

12 "Y" Tubes

The Y tube or outlet cup converts two tubes into one. It can be used in deep banding, side dressing, predrilling, inter-row sowing, split function and other sowing applications

13 Swivel Coulters

The use of rigid swivel coulters is recommended in most applications where minimal soil disturbance and maximum moisture retention is desired in direct drilling applications. These coulter are not recommended for use in rocky or stoney conditions.

14 Sixth Toolbar

A sixth toolbar is available that connects into the front hitch of the Agrowdrill.

Fitting the sixth toolbar allows the Agrowdrill to be used in the following ways:

a) Five sowing rows plus coulters.
   This may be an advantage in very heavy surface trash conditions.

b) Six sowing rows, no coulters.
   This may be a useful setup for direct drilling where coulters are not required or when using cultivator points.

c) Certain specialised seeding jobs such as side banding fertiliser or rowcrop.

Fitting procedure for the sixth toolbar is as follows:

a) Attach the optional toolbar to the front of the Agrowdrill frame using the linkage pins provided. Ensure all pins are locked into position.

b) Rearrange the spacings of tines and coulters on the rows appropriate to the row spacing you wish to use.

c) Install tine assemblies of the coulters or tines onto the sixth bar at your desired row spacings.

d) Carefully check that the soil openers and coulters are properly aligned.

e) Retighten all mounting bolts after approximately 30 minutes operation.

15 Internal Lid Assemblies

Internal flip over lids can be fitted underneath the main lid to stop inappropriate spillage of seed or fertiliser into other hoppers when filling.

Optional Equipment

16 Moisture Skirts

Moisture skirts can be fitted to the base of the hopper in wetter climates to protect the metering mechanism, seed cup and hoses from excessive dampness and moisture infiltration.

17 Fertiliser Screens

Fertiliser screens can be used to screen out large, hard lumps of fertiliser that may impede constant metering.

18 Hungry Boards

Hungry boards can be fitted to the top of hoppers to increase hopper capacities by 50 percent.

To fit hungry boards follow this procedure:

a) Purchase the hungry boards for your model Agrowdrill.

b) Remove the gas struts and hopper lid.

c) Place silastic or an appropriate sealing compound around the top of the hopper, and along the top betrween the compartments.

d) Place the hungry boards into position and attach them to the hopper with the screws provided.

e) Fit the main hopper lid and gas struts to the top of the hungry boards.

Lubrication and Maintenance

Agrowdrill Maintenance

The Agrowdrill is an extremely robust and durable machine and will give you many years of service with simple routine maintenance.

1 A Pre-Operation Check

Check the following points before operation:

- Check all nuts and bolts are tight.
- Check tine spacings are correct.
- Check all sowing hoses and tubes are unblocked and correctly positioned.
- Check all grub screws are tight.
- Check chain adjusters are correctly tensioned.
- Check metering shafts are easily turned, using the crank handle provided. The shafts should not be jammed or hard to turn.
- Check the hectaremeter is installed correctly and functioning properly.

2 Daily Service

Before starting work each day you should carefully check the Agrowdrill for the following:

a) Loose soil opener mounting bolts. Tighten as necessary.

b) Excessively worn soil openers. Replace as necessary.

c) Bent or blocked down tubes. In rough or stony conditions you may bend the bracket which mounts the downtube to the rear of the tine. Straighten or replace these if bent.

d) Excessively worn coulters. Replace as necessary.

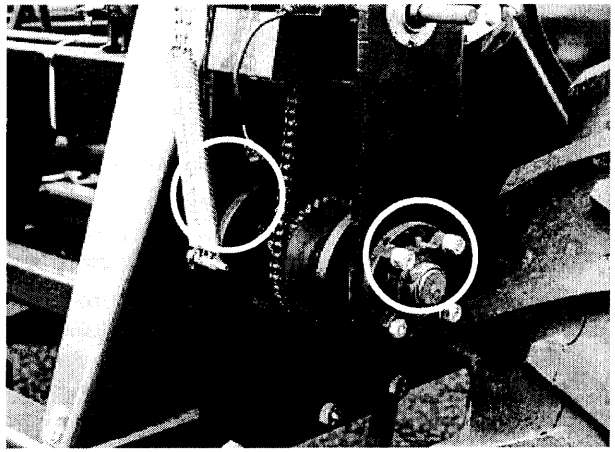
e) Quick visual check of the whole unit.

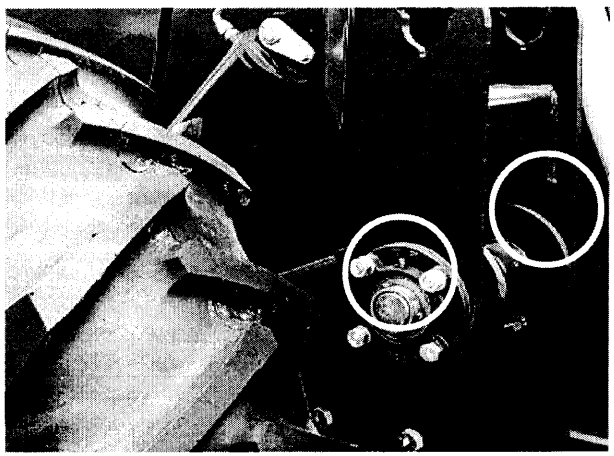
3 Lubrication

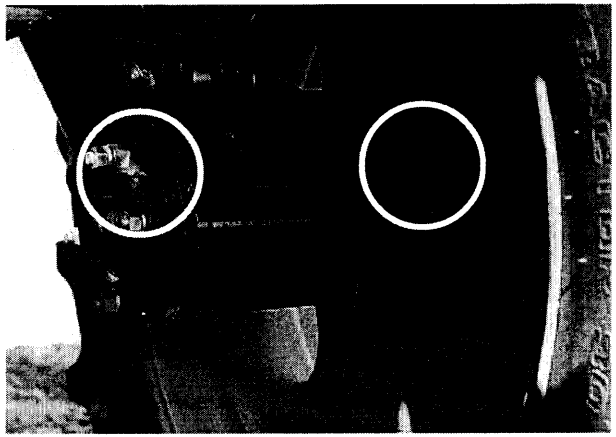
Lubrication points intervals are as follows:

	Item	Action	Period
1	Drive Chains	Apply Oil	20 Hours
2	Wheel Axle Bearings	Grease	80 Weeks
3	Chains	Wash & Grease	200 Hours
4	Varibox	Check oil	200 Hours
5	Varibox	Change Oil	3 Years

Below: Grease Wheel arm pivots every 80 hours.

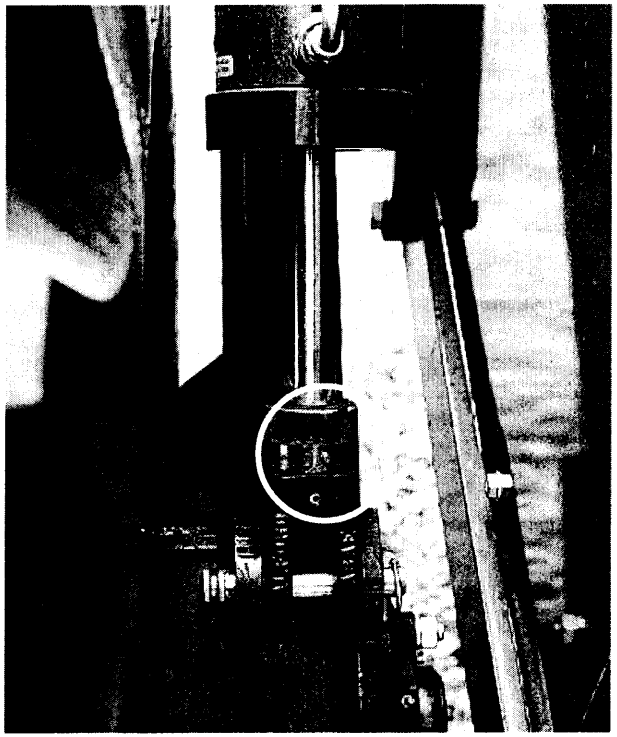






Above: Grease wheel axles every 2 weeks.

Below: Grease depth stops regularly.



Lubrication and Maintenance

4 Cleaning Seed and Fertiliser Hoppers

Thorough cleaning of the seed and fertiliser hoppers is very important for a number of reasons. These include:

- Fertiliser left in the hopper will cause corrosion of the metal parts of theAgrowdrill.
- If you are changing to a different seed you must be sure to remove all the previous seed.
- Seed left in the Agrowdrill will be a harbour for mice, rats and insects.

The following is the procedure for cleaning:

a) Try to have as little seed or fertiliser as possible remaining after finishing the seeding.

b) Scrape all the remaining seed and fertiliser to one side and scoop into bags or buckets. Sweep the bottoms of the hoppers clean with a broom.

c) Remove all blanking off caps (See figure 11, page 35) and open the gate under the fluted rollers.

d) You can use an air compressor or a water hose to blow or wash out the remaining seed and fertiliser. You may prefer to use a vacuum cleaner and suck out the remaining seed and fertiliser.

e) Close the gate under the fluted rollers (see figure 12, page 36) and reinstall the blanking off caps over the correct side of the fluted rollers (see adjusting seed and fertiliser rates, page 35).

f) Clean any spilled seed or fertiliser which may have accumulated on top of the frame.

Note: If you wash the Agrowdrill with water be sure to allow the hoppers to dry out thoroughly standing in the sun with the lid open.

When the Agrowdrill is clean and dry you can apply a light coating of diesel to the insides of the hoppers. This will prevent any corrosion from fertiliser.

5 Replacing Baker Boots

Models fitted with standard coil tines are equipped with Tungsten Carbide tipped soil openers which are extremely wear resistant.

You should replace openers when they wear past the tungsten tip and lose their point. Blunt tips or worn heels will reduce the digging efficiency and accuracy of seed placement of the Agrowdrill.

The procedure for replacing soil openers is as follows:

a) Purchase new soil openers from your Agrowplow dealer.

b) Place the Agrowdrill on a hard surface and lift to the highest position. Support the machine with solid blocks or jackstands so that you can safely work underneath.

Danger Warning: Do not place any part of your body under the drill without first fixing the lifted drill with solid blocks and/or stands so that it cannot come down. Never rely on tractor hydraulics if you are placing any part of your body under the drill. Failure to do this may cause serious injury or death.

c) Remove the two retaining bolts which attach the opener and remove the worn openers (see figure 15).

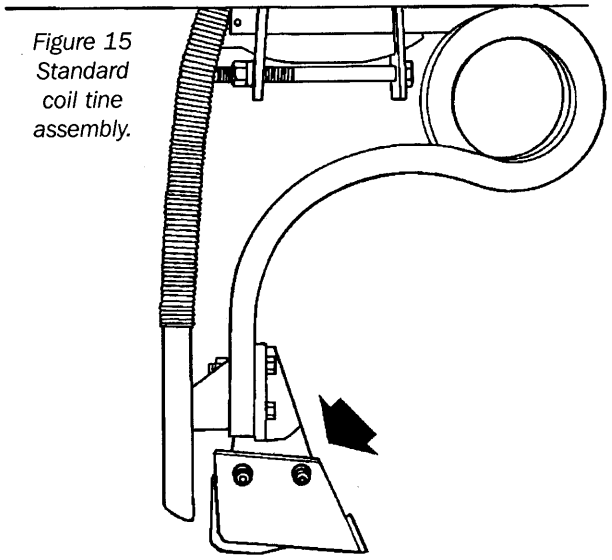


Figure 15 Standard coil tine assembly.

d) Replace any bolts which are worn or damaged, and install the new openers tightening the bolts firmly.

Note: In extremely hard or abrasive conditions you may need to use cast openers with tungsten tips.

6 Coulter Replacement

Coulter replacement procedure is as follows:

a) Place the Agrowdrill on a hard surface and lift to the highest positon. Support the machine with blocks so that you can safely work underneath.

Danger Warning: Do not place any part of your body under the drill without first fixing the lifted drill with solid blocks and/or stands so that it cannot come down. Never rely on tractor hydraulics if you are placing any part of your body under the drill. Failure to do this may cause serious injury or death.

Lubrication and Maintenance

b) Loosen the coulter clamp and remove the coulter assembly by sliding it out.

c) Remove the worn coulters and replace them with new ones of the correct size. Tighten bolts and ensure the coulter rotates freely.

d) Reinstall the coulter assemblies and ensure each is aligned with its soil opener and set to the correct depth.

The Agrowdrill is equipped standard with 305mm (12") coulters. Replacement coulters are available from you Agrowplow dealer in both 305mm (12") and 350mm (14") sizes.

7 Servicing Downtube Assemblies

Use the following procedure to service downtube assemblies:

a) Remove the rubber boot from the retaining lugs on the fluted roller housing (See figure 16).

b) Twist the bottom of the flexible tube off the seeding boot and remove the downtube assembly.

c) Screw out the flexible tube.

d) Replace the rubber boot or flexible tube as required. Ensure the new flexible tube is of a similar length.

8 Replacing Adjustable Gates

The adjustable gates are controlled by the hexagonal rod connected to the adjustment lever.

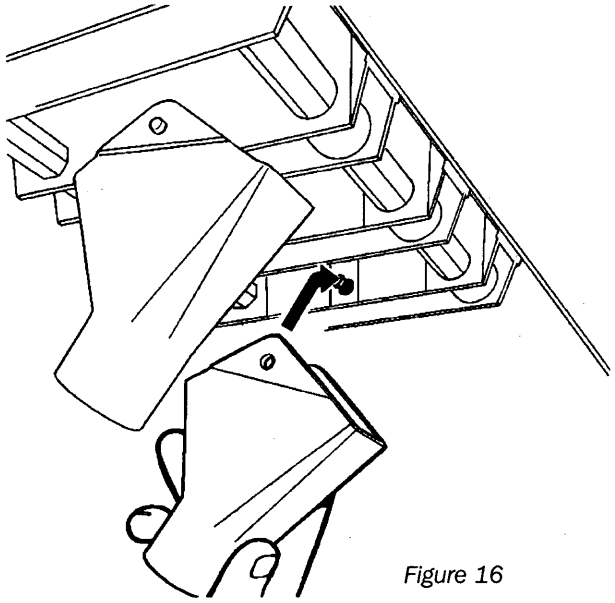


Figure 16

Use the following procedure to replace the adjustable gates:

a) Remove the drive chain cover plates from the left side of the hopper (See page 35).

b) Loosen the bolt which retains the gate adjusting lever.

c) Slide the hexagonal shaft out and remove worn or broken gates as required.

d) Slide the shaft back in, assembling and replacing the gates as necessary.

e) Tighten the bolt which retains the gate adjusting lever.

f) Replace the drive chain cover plate on the left side.

9 Servicing Fluted Rollers

The fluted rollers are driven by hexagonal shafts through drive chains and sprockets on the left side of the Agrowdrill. These shafts are support by self aligning ball bearings adjacent to the sprockets and by glass filled nylon bushes mounted between every third seeding row.

Servicing procedures are as follows:

a) Drive sprocket bearings:

i Remove the drive chain cover.

ii Remove the drive chain, remove the Allen key grub screws which retain the drive sprocket and slide the sprocket off the end of the shaft (see figure 17 on page 52).

iii Remove the two mounting bolts from the self aligning ball bearing. and slide the bearing off the end of the shaft.

iv Replace the bearing and reinstall, reversing the above procedure.

b) Fluted Rollers:

i Remove the drive chain cover and drive chain.

ii Remove the two mounting bolts from the self aligning ball bearing. (see figure 17, page 52).

iii Pull the drive shaft out. In most cases it won't be necessary to remove the shaft completely. Slide the hexagonal shaft only far enough to reach worn or damaged fluted rollers.

iv Replace the rollers as necessary and reverse the above procedure to reassemble.

Lubrication and Maintenance

c) Drive shaft mounting bushes:
The Agrowdrill is fitted with glass filled nylon bushes between every third row.

These bushes require no lubrication, are extremely wear resistant and should last the life of the machine.

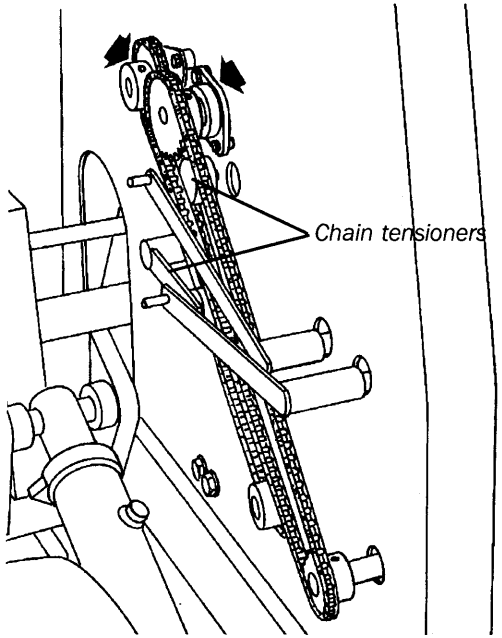
Use the following procedure if service is needed:

i Remove the fluted roller drive shaft as outlined above.

ii Remove the retaining bolt from the worn or damaged bush (See Figure 18 on the right) and replace the bush.

iii Reinstall the drive shaft using the reverse of the above procedure.

Figure 17: Metering roller drive mechanism.



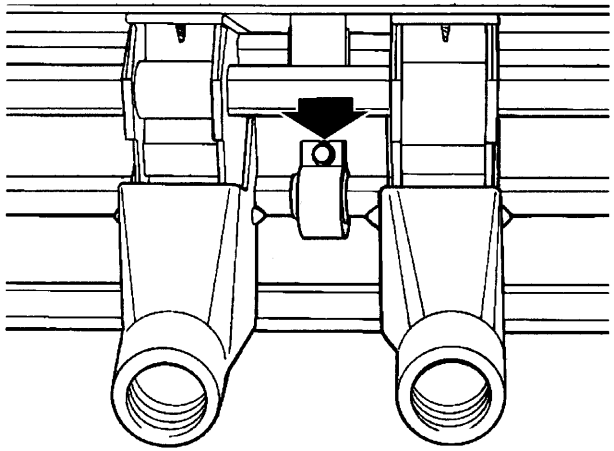


Figure 18: Drive shaft mounting bushes.

d) Major Sevicing of Metering Mechanisms
In the event of metering mechanisms requiring major service, you can completely remove the bottom of the hoppers.

Use the following procedure:

i Remove the down tube assemblies and fluted roller drive sprockets and ball bearing assembly as outlined above.

ii Remove all blanking off caps.

iii Remove the retaining bolt from the front and rear of each fluted roller assembly and lower the entire metering mechanism from the bottom of the hoppers.

iv Installation procedure is the reverse of the above. You will need to reseal the ends of the metering assembly (See figure 17 on the left) with a quality silicone sealant.

e) Servicing Gearboxes
The Agrowdrill infinitely variable gearbox requires no maintenance except for:

- Check the oil level annually
- **Changing the oil every 3 years.**

Exchange units are available from the Agrowplow dealer in the event of major breakage. Check the oil level and top up the gearbox oil using the level and filler plugs indicated in Figure 19 below.

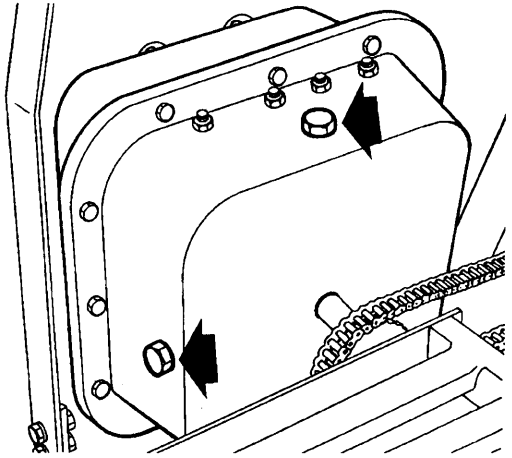


Figure 19: Gearbox oil plug locations.

f) Drive Chain Adjustments
Chain tensioners are provided in the drive wheel arm, on the chains to the gearboxes and on the chains to the fluted roller shafts. All chains should be adusted until there is about 25mm of on the driving side of the chain. See figure 17.

The **primary drive chain in the wheel arm** is fitted with two nylon tensioning pads. The procedure to adjust for chain wear is as follows:

Lubrication and Maintenance

i Loosen the nyloc locknut and rotate the adjusting screw to adjust the tensioning pad up or down until the chain has approximately 25mm of play on the drive side. **Be sure to retighten the nyloc locknut** after adjustment.

ii If insufficient adjustment is available using one pad, loosen the other and repeat the process.

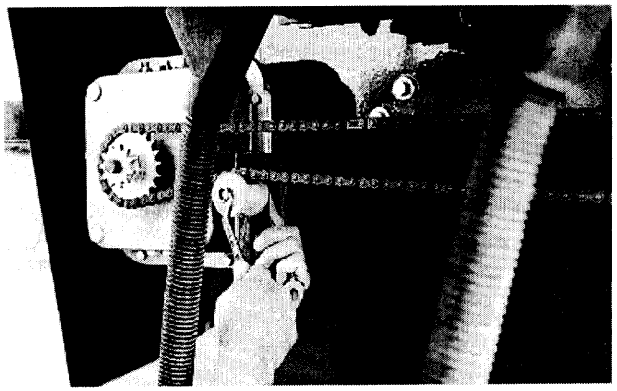
iii If there is no more adjustment available you may need to remove a link from the chain, replace the drive chain and/or replace the adjusting pads.

g) Drive Chain Maintenance

The drive chains will benefit from some lubrication.

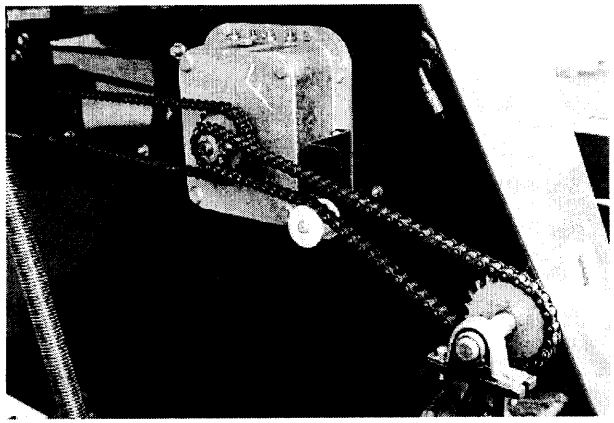
You may choose either of the following methods of lubrication:

- Oil the chains regularly during seeding using a quality chain oil.
- Remove the drive chains annually and store them in a pot of chain oil.



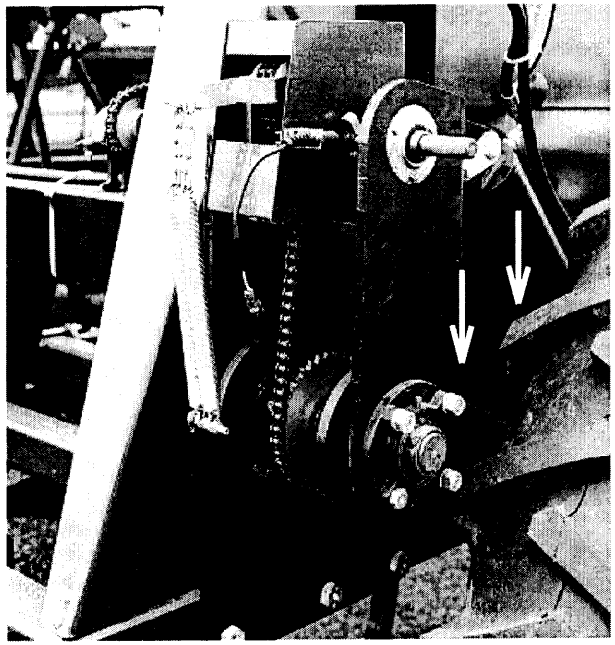
Above: Keep 2nd gearbox drive chain properly adjusted.

Note: The most crucial measure to ensure **long chain life** is to avoid leaving the machine exposed to the weather between seeding jobs.



Above: Keep primary gearbox drive chain properly adjusted.

Below: Keep wheel arm drive chains properly adjusted.



Hectaremeter Shaft Sensor Installation

The magnet, fitted to the shaft must sweep past the sensor once per rotation as shown, with a clearance of 3 - 5mm (See figure 20). Do not use substitute magnets.

Clamp the shaft magnet (part No. AA - 117 obtainable from your local Farmscan dealer or authorised service agent) around a shaft or lock collar, which is driven by a ground wheel The clamp is adjustable from 19 - 38mm diameter. The magnet may be transferred to a larger clamp if necessary.

The sensor and magnet must face end to end.

Do not remove sensor from the aluminium bracket supplied, otherwise damage will result.

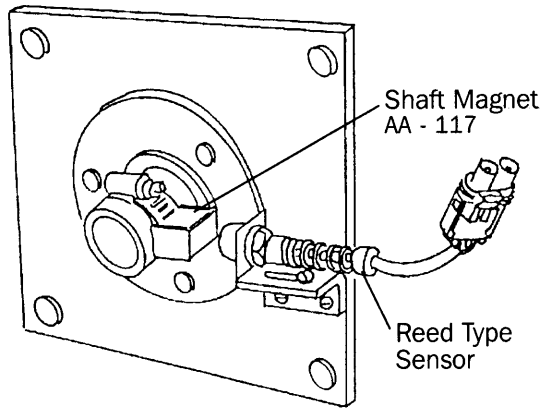


Figure 20: Shaft sensor installation.

Lubrication and Maintenance

As the sensor is not affected by moisture or mud the main precaution is to protect the sensor and cable from physical damage. As a precaution, keep the shaft sensor cable away from, aerial leads, engine kill switch cable or wires to electronic clutches and solenoid valves. Use cable ties supplied to secure sensor cable and connect into Hectaremeter unit.

Hectaremeter Sensor & Cable Test Procedure

Check the function of the hectaremeter sensor and cable by the following procedure:

1 Switch Hectaremeter ON

2 Check that H1 and H2 calibration factors are entered correctly.

3 Press SPEED key. Display should read 0.0

4 Disconnect sensor from cable, at the sensor itself.

5 Use a pair of long nose pliers and intermittently short the pins of the connecting plug on the cable together. The speed readout should show random numbers. If speed readout responds, then replace sensor.

6 If no response, reconnect sensor and repeat test at tractor breakaway plug (if used). At this point if the speed responds, then the cable between the breakaway plug and the sensor is at fault.

If still no response at tractor breakaway plug, repeat test at connection directly into the Hectaremeter unit.

7 If no response directly into Hectaremeter then return unit to your nearest Farmscan dealer or authorised service agent.

Hectaremeter Multimeter Test

Reed Type Sensor

Check the function of the reed type sensor using the following procedure:

1 Disconnected sensor from cabie.

2 Rotate the shaft / pulley so that the magnet is as close as possible to the sensor.

3 Measure the resistance of the sensor, it should be a short circuit.

4 Rotate the shaft / pulley so that the magnet is as far as possible from the sensor.

5 Measure the resistance of the sensor, it should be an open circuit.

Sensor Cable

Check the function of the sensor cable using the following procedure:

I Disconnect Hectaremeter and Sensor from sensor cable.

2 Place a sturdy wire link across the two terminals at the Hectaremeter end of the cable.

3 Measure the resistance across the two terminals at the sensor end, it should be a short circuit.

If the above is true, then the sensor cable is O.K. (skip the following points).

If the above is not true then there is a fault in the cable.

4 Check that any breakaway connections in between are clean and firm to connect, if loose to connect, use a small object to close the female connection slightly.

5 Physically inspect cable for damage, it may have been crushed or cut.

End of Season Storage

Shedding your Agrowdrill for protection against the weather will ensure a long and trouble free working life.

Ensure chains are properly oiled and covered before storage or remove chains and store them in an oil bath.

Ensure all grease nipples are thoroughly greased before storage. By excluding all air and moisture from inside the bearings, it mimimises the chance of corrosion occuring.

For the best results, grease the bearings while the still warm from last working.

Trouble Shooting Guide

THE PROBLEM	THE CAUSE	THE CURE
Poor penetration.	1 The soil is too dry. 2 Worn soil openers. 3 Insufficient weight. 4 Machine not level fore and aft.	1 Wait for rain or irrigate. 2 Replace the soil openers. 3 Keep hoppers full. Fill tyres with water to add weight or remove coulters to increase weight per tine. 4 Adjust the level as outlined in the Setting Up Section.
High soil opener wear.	1 The soil is too dry. 2 Working too deep. 3 Highly abrasive soil.	1 Wait for rain or irrigate. 2 Adjust the Agrowdrill to seed at a shallower depth. 3 Use Tungsten tipped blades.
Tines "laying back".	1 The soil is too dry and hard. 2 Not level fore and aft. 3 Working too fast.	1 Wait for rain or irrigate. 2 Level the machine (See Setting Up section). 3 Slow to a suitable speed.
Too much surface disturbance.	1 Not working deep enough. 2 Working too fast. 3 Coulters not cutting cleanly. 4 Opener not aligned with coulter.	1 Adjust deeper. 2 Slow to a suitable speed. 3 Sharpen the existing coulters, fit new coulters or invert the walking beam as outlined in the Setting Up Section. 4 Align coulter correctly as outlined in the Setting Up Section.
Uneven soil opener wear.	1 Machine not level. 2 Compaction behind the tractor tyres.	1 Level the machine as outlined in the Setting Up Section. 2 Reduce the load on the rear tractor tyres.
Too deep on one side.	1 Incorrect depth setting. 2 Low depth wheel tyre pressure on one side. 3 Low tractor tyre pressure.	1 Carefully set even depth on both sides as outlined in the Setting Up section. 2 Set tyre pressures to the recommended pressure. See Setting Up section. 3 Inflate as recommended in your tractor manual.

Trouble Shooting Guide

PROBLEM	CAUSE	REMEDY
Machine blocking up with trash.	1 Too much trash. Control weeds before seeding. 2 Wet conditions. 3 Coulters not cutting properly.	1 Graze heavily or slash the paddock before seeding. 2 Allow the soil and trash to dry before seeding. 3 Sharpen or fit new or fluted coulters.
Blocked downtubes or seeding boots.	1 Mud build up. 2 Insect or rodent nests. 3 Kinked downtube.	1 Clean out the blockage and wait for dryer conditions. 2 Remove the downtube and clean. Prevent mice or insects infestations. 3 Repair or replace. Avoid conditions where tubes may be damaged.
Coulter "bulldozing" soil.	1 Coulter worn out. 2 Seized bearing.	1 Replace coulter as outlined in the Maintenance section. 2 Replace coulter bearing. See Maintenance section.
Falling fertiliser rate.	1 Powder build up in the hopper. 2 Caking due to moisture.	1 See Operating tips (Page 44). 2 See Operating tips (Page 44).
Seed or Fertiliser not running at the correct rate.	Seed or fertiliser different to that used to calibrate the drill.	See Operating tips (Page 44).
One or more rows not delivering seed or fertiliser. (Downtubes and seeding boots not blocked)	1 Blocked or stripped fluted rollers. 2 Fertiliser clods in hopper.	1 Clean out hoppers, clear any blockages and inspect the fluted rollers. Service as outlined in the Maintenance section. 2 Clear blockages as above.
One or more rows running seed or fertiliser too quickly.	1 Blanking-off cap missing or on the wrong side. 2 Broken adjustable gate.	1 Clean out the hopper and check the blanking off caps. 2 Check adjustable gates and service as outlined on the Maintenance section.

Trouble Shooting Guide

THE PROBLEM	THE CAUSE	THE CURE
Poor lift response.	1 Air in the remote hydraulic hose. 2 Low oil level in the tractors hydraulics.	1 Bleed the air from the system. 2 Check the hydraulic system and top up if necessary.
Self feeding grain and fertiliser.	1 Gate settings too wide. 2 Blanking Off Caps not in place. 3 Damaged gate.	1 Close up the gate setting. 2 Check the positioning of the Blanking Off Caps. 3 Replace.
Failure of the metering system to deliver seed or fertiliser.	1 Sprockets loose on the drive shaft. 2 Gearbox breakdown. 3 Chain dismounted from the drive sprockets.	1 Tighten or replace the Grub screw securing the sprocket onto the shaft. 2 Remove the gearbox and exchange a service unit from your Agrowplow dealer. 3 Check the alignment of the drive sprockets and re-align as necessary. Check the condition of the drive chain and replace if necessary.

Hectaremeter Trouble Shooting

THE PROBLEM	PROBABLE CAUSE / REMEDY
1 No Response from ON/OFF Switch	a) Check that power cable connections at battery, are clean and tight. b) Measure voltage from power cable at monitor connectior point. It should be between 12 - 13.8 V DC 7. c) If voltage OK and unit fails, return to your nearest Farmscan dealer or authorised service agent.
2 Hectaremeter Total Wrong	a) Check that H1 and H2 calibration factor are measured and set correctly. b) Is machine overlapping or underlapping? c) Is the unit counting headlands 7 - Fit a Standby option (contact your authorised Farmscan agent). d) Switch to SPEED readout and make sure reading is constant at a constant speed. Could be cable or sensor damage if speed readout is jumpy. e) Is the magnet and sensor facing end to end? f) Is the proper magnet being used? g) Is the magnet too far away from sensor? (3-5 mm gap). h) Is the magnet staying in line with sensor on corners? i) Is the wheel loose? j) Is the sensor on a non driven wheel / or a shaft driven by a wheel? - Tractor drive wheels cause over reading. k) Replace wheel / shaft sensor, if none of the above.
3 Decimal Point will Not Flash	a) This is normal operation if the TOTAL hectares being displayed is greater than 999.9, or it is extremely cold.
4 Hectare or Speed Does Not Work	a) Your speed must be above 2.0 kph for it to register, however area registers at any speed. b) Check that H1 and H2 calibration factors are properly entered. c) Check magnet and sensor are properly aligned with a 3 - 5mm gap. d) If using a Standby option, disconnect standby from sensor cable and reconnect cable as normal, to isolate if standby malfunction is the cause.
5 Trip or Total Hectares don't Reset	a) Press TOTAL or TRIP key first to select area to be cleared. b) Reset key must be pressed and held down for at least 3 - 4 seconds. c) If hectares still don't reset, return unit to your nearest Farmscan dealer or authorised service agent.

Hectaremeter Trouble Shooting

THE PROBLEM	PROBABLE CAUSE / REMEDY
6 Hectares Count Up on their own Without Moving **or Calibration Figures Keep Changing**	a) Switch off all other electronics to eliminate electrical interference as the cause. If switching off electronics eliminates the fault, ensure that the Hectaremeter cables are not running alongside wiring from other electronic devices, and/or physically move the position of the Hectaremeter in relation to the other equipment. b) If petrol engine in close proximity, stop engine to see if interference is caused by engine ignition system. NOTE: Carbon ignition leads must be fitted to spark plugs and coil to stop interference. c) Disconnect sensor from cable at wheel/shaft. If problem stops, replace sensor. d) Make sure Hectaremeter has independent power cable, wired direct to battery +/- terminals. e) If unit still counts hectares, return unit to your local Farmscan dealer or authorised service agent.

Spare Parts Identification Lists

The following section includes a complete list of all the replacement parts available for the Agrowdrill.

This is exactly the same parts manual as the dealer uses; helping you to avoid any confusion when ordering part by phone. Please use the following procedure if you are ordering by phone:

a) Find the part and the number in the book

b) Ring the dealer spare parts department and quote the machine's serial number. (The salesperson needs this so as to be sure he or she is opening the right book)

c) Quote the:
   - PAGE number,
   - PART number, and the
   - DESCRIPTION of the part to the salesperson.

Be sure that you are both looking at the same Agrowdrill Manual, diagram and parts list.

Following the above procedure SHOULD avoid confusion and ensure your satisfaction.

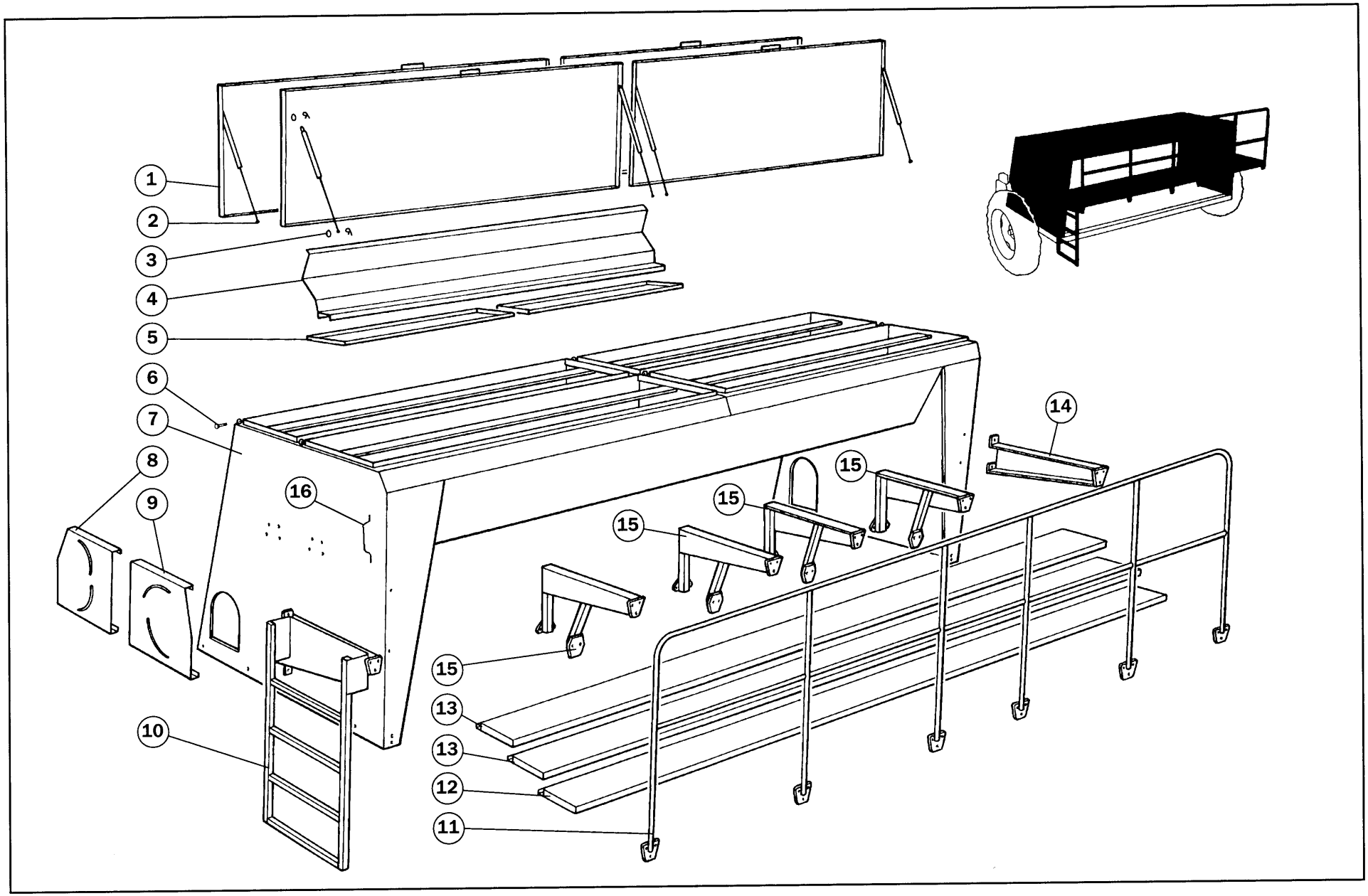
Note: We at Agrowplow are continually refining and developing our products to ensure the best possible performance in the field.

Unfortunately this means that changes are made to components of our machinery which may not be included in this parts list.

Our policy of continual improvement often results in new improved components replacing existing ones.

Your Agrowplow dealer receives regular updates of spare parts information and will make every effort to ensure you are promptly supplied with the correct components.

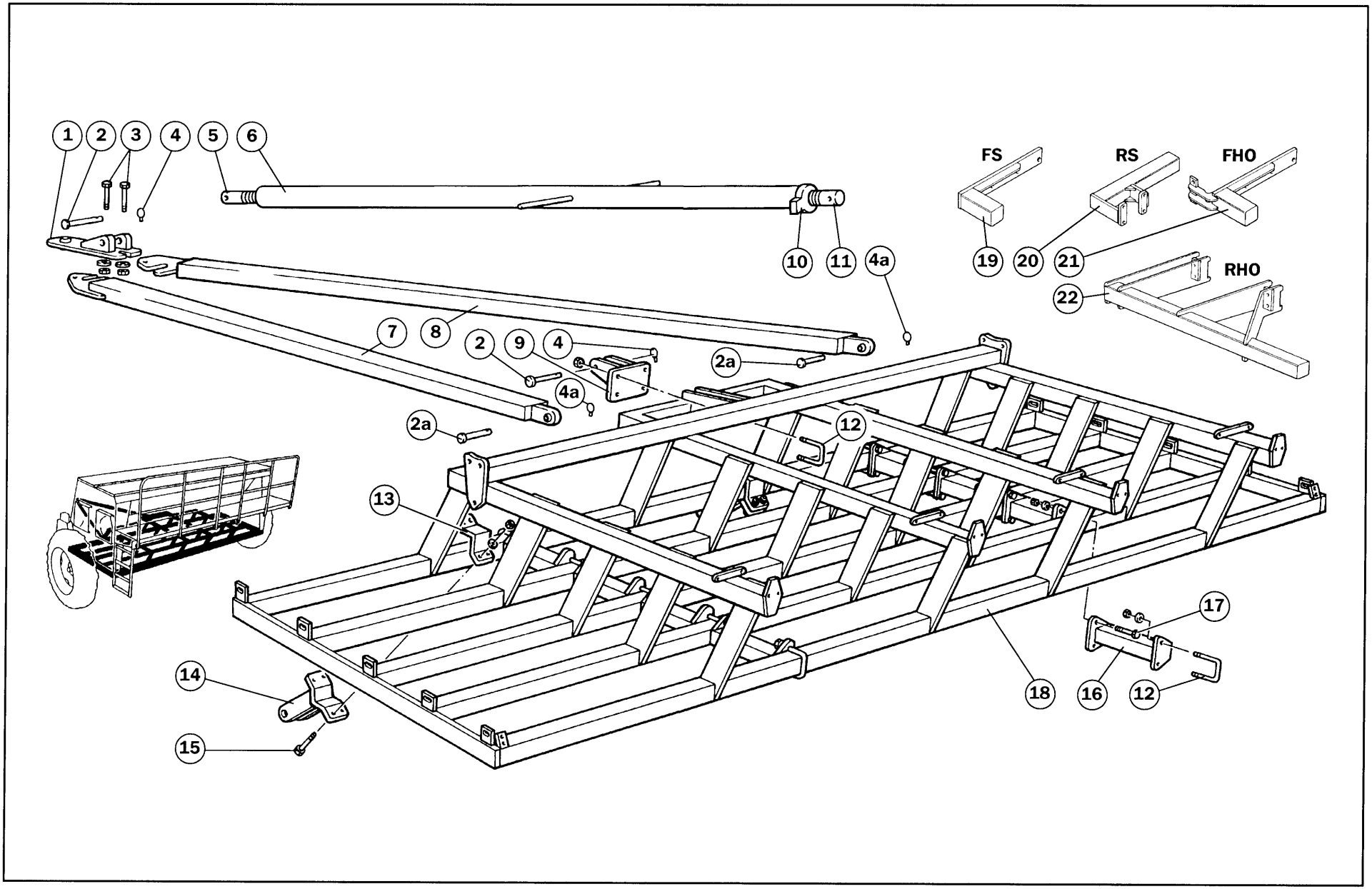
Hopper Assemblies



Hopper Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	AD95 Lids	113-2011	4	4	4	4
2	Gas Struts	115-701	8	8	8	8
3	Strut Pin & Nut Assembly	132-1011	16	16	16	16
4	Internal Lids	113-3049	4	4	4	4
5	Fertiliser Screens - outer box	113-3054	4	4	4	4
	- Inner box	113-3055	4	4	4	4
6	Lid Bolts 5/8" X 21/2"	133-260	8	8	8	
7	AD95 Box	113-1001/20	1	-	-	-
		113-1001/24	-	1	-	-
		113-1001/28	-	-	1	-
		113-1001/32	-	-	-	1
8	Vari Box Quadrant Guard LH.	113-3037	1	1	1	1
9	Vari Box Quadrant Guard RH.	115-117	1	1	1	1
10	Ladder	113-3030	1	1	1	1
11	AD95 Hand Rail	113-4060	1	1	1	1
12	Male/Male Walkway	225-002	1	1	1	1
13	Male/Female Walkway	225-003	2	2	2	2
14	Outer Platform Support	113-3027	1	1	1	1
15	Inner Platform Support	113-3028	2	2	2	2
16	AD95 Grad Handle	113-4059	1	1	1	1

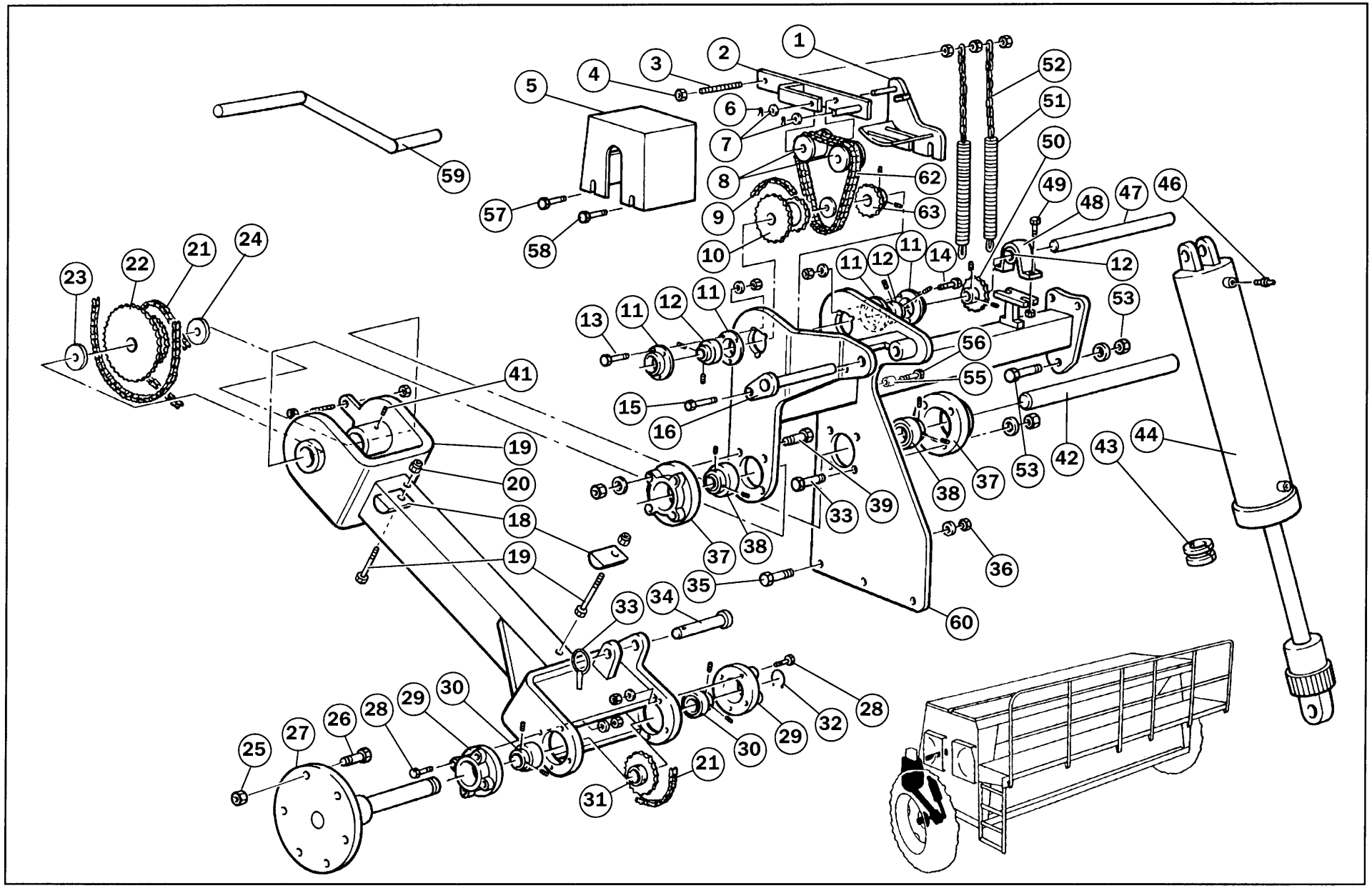
Frame Assemblies



Frame Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	Tow Tongue	099-201	1	1	1	1
2	Cat II Top	140-001	2	2	2	2
2a	Cat III Bottom	140-005	2	2	2	2
3	1" X 51/2" UNC Bolt	133-2077	2	2	2	2
4	Cat II Lynch Pin	140-039	2	2	2	2
4a	Cat III Lynch Pin	140-041	2	2	2	2
5	LH Screw	111-003	1	1	1	1
6	Levelling Tube	113-3052	1	1	1	1
7	LH A-Frame Arm	099-202	1	1	1	1
8	RH A-Frame Arm	099-203	1	1	1	1
9	Top Tow Lug (AD95)	113-3038	1	1	1	1
10	RH Screw Lock Nut	134-042	1	1	1	1
11	RH Screw	111-002	1	1	1	1
12	U-Bolt 4" X 3/4"	130-100	6	6	6	10
13	Bottom Tow Lug Clamp Plate	107-333	2	2	2	2
14	AD95 Bottom Toe Lug	113-3023	2	2	2	2
15	3/4" X 23/4" Bolt	133-370	8	8	8	8
16	AD95 Spreader	113-3032	8	8	8	16
17	3/4" X 7" Bolt	133-2042	12	12	12	24
18	AD95 Frame	133-2015/20	1	-	-	-
		133-2015/24	-	1	-	-
		133-2015/28	-	-	1	-
		133-2015/32	-	-	-	1
19	Front Ext. Stub (STD)	113-3040	2	2	2	2
20	Rear Ext. Stub (STD)	114-3034	2	2	2	2
21	Front Heavy Duty Ext. Stub	114-3102	2	2	2	2
22	Rear Heavy Duty Ext. Stub	114-3101	2	2	2	2

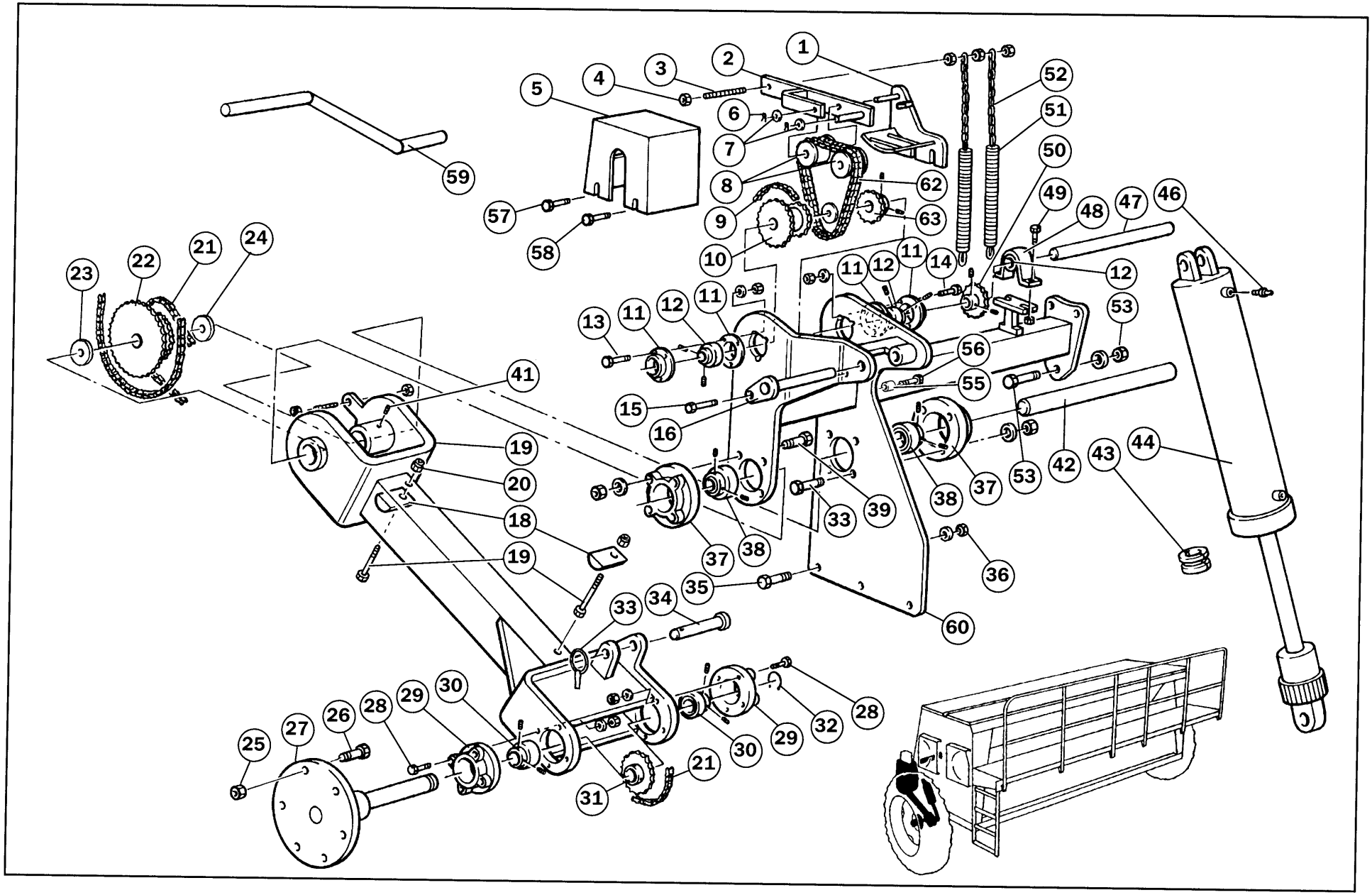
Left Hand Wheel Assembly



Left Hand Wheel Assembly Parts List (Items 1-32)

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	Clutch Cradel	116-318	1	1	1	1
2	Clutch Pivot	116-319	1	1	1	1
3	M10 Thread Bar 70long	130-480	2	2	2	2
4	M10 Nuts	134-055	6	6	8	8
5	Clutch Guard	116-208	1	1	1	1
6	1/8" X 11/2" Split Pins	140-440	2	2	2	2
7	M20 Washer	135-110	2	2	2	2
8	Nylon Clutch Rollers	116-416	2	2	2	2
9	5/8" Chain	137-1058	1/2 box	1/2 box	1/2 box	1/2 box
10	5/8" 21 T X 1/2" 21 T Double Sprocket	113-3057	1	1	1	1
11	1" Round Bearing Housing	138-3010	6	4	4	4
12	1" Bearing	138-3007	3	3	3	3
13	5/16" X 11/4" Bolt	133-050	3	3	3	3
14	5/16" X 11/2" Bolt	133-060	3	3	3	3
15	11/4" X 1/2" Bolt	133-170	1	1	1	1
16	Top Cylinder Pin	113-4026	1	1	1	1
17	LH Wheel arm	113-2013	1	1	1	1
18	Nylon Wheel Arm Chain tension Bolt	117-435	2	2	2	2
19	AD95 Wheel Arm Chain tension Bolt	113-4015	2	2	2	2
20	M10 Nylock nut	134-050	2	2	2	2
21	5/8" Chain	137-1058	1 box	1 box	1 box	1 box
22	Wheel Arm Drive Sprocket 5/8" 21 T X 35 T Double	113-3056	1	1	1	1
23	13mm Spacer	117-410	1	1	1	1
24	140mm Spacer	113-4016	1	1	1	1
25	M18 Wheel Nuts	115-716	6	6	6	6
26	M18 X 60 Studs	115-717	6	6	6	6
27	AD95 Hub	113-3029	1	1	1	1
28	3" X 5/8" Bolt	133-280	8	8	8	8
29	UC212 Bearing Housing	138-1032	2	2	2	2
30	FC212 Bearing	138-1042	2	2	2	2
31	60mm Base Drive Sprocket 5/8" 24T	113-4048	1	1	1	1
32	60mm Ext. Circlip	136-1027	1	1	1	1

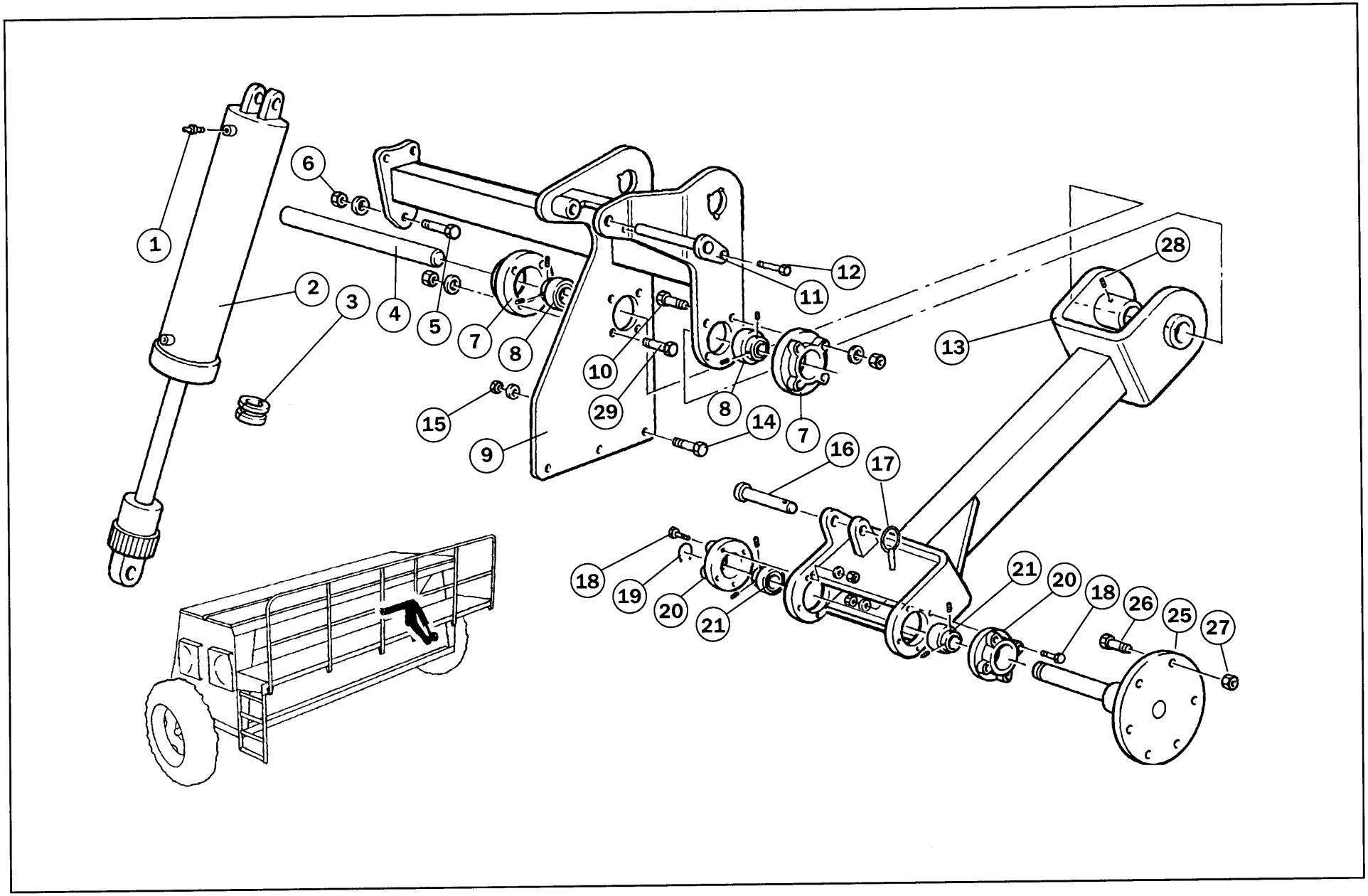
Left Hand Wheel Assembly



Left Hand Wheel Assembly Parts List (Items 33-63)

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
33	Cat II Lynch Pin	140-039	1	1	1	1
34	Cat II Top Pin	140-001	1	1	1	1
35	3" X 1" Bolt	133-2067	3	3	3	3
36	1" Nylock nut	134-1081	3	3	3	3
37	210 Bearing Housing	138-052	2	2	2	2
38	FC210 Bearing	115-704	2	2	2	2
39	21/2" X 5/8" Bolt	133-260	5	5	5	5
40	23/4" X 5/8" Bolt	133-270	3	3	3	3
41	M10 X 16 Grub Screws	131-2018	2	2	2	2
42	AD95 Pivot Pin	113-4030	1	1	1	1
43	1 set Depth Stops	164-000	1 set	1 set	1 set	1 set
44	41/2" Cylinder	153-024	1	1	-	-
45	43/4" Cylinder	153-025	-	-	1	1
46	Cylinder Nipple	154-019	2	2	2	2
47	AD95 1" Idle shaft	113-4047	1	1	1	1
48	Bearing Housing UB PP 205-165	138-3004	1	1	1	1
49	5/16" X 11/4" Bolt	133-050	0	2	2	2
50	5/8" 2 I T Sprocket 1" Bore	113-4050	1	1	1	1
51	Large Clutch Spring	132-225	1	2	2	2
52	10 Link Chain	137-130	1	2	2	2
53	3" X 1" Bolt	133-2067	3	3	3	3
54	1" Nylock Nut	134-1081	3	3	3	3
55	Wheel arm Pivot Chain Tension (Nylon)	113-4058	1	1	1	1
56	Wheel arm Pivot Chain Tension Bolt -21/2" X 5/16"	133-1030	1	1	1	1
57	11/2" X 5/16" Bolt	133-060	2	2	2	2
58	11/4" X 5/16" Bolt	133-050	1	1	1	1
59	AD95 Crank Handle	113-3058	1	1	1	1
60	Wheel arm Carrier LH.	113-3013	1	1	1	1
61	Nylon Clutch Space	113-4055	1	1	1	1
62	Clutch Chain	137-115	1	1	1	1
63	21 T Sprocket	113-4051	1	1	1	1

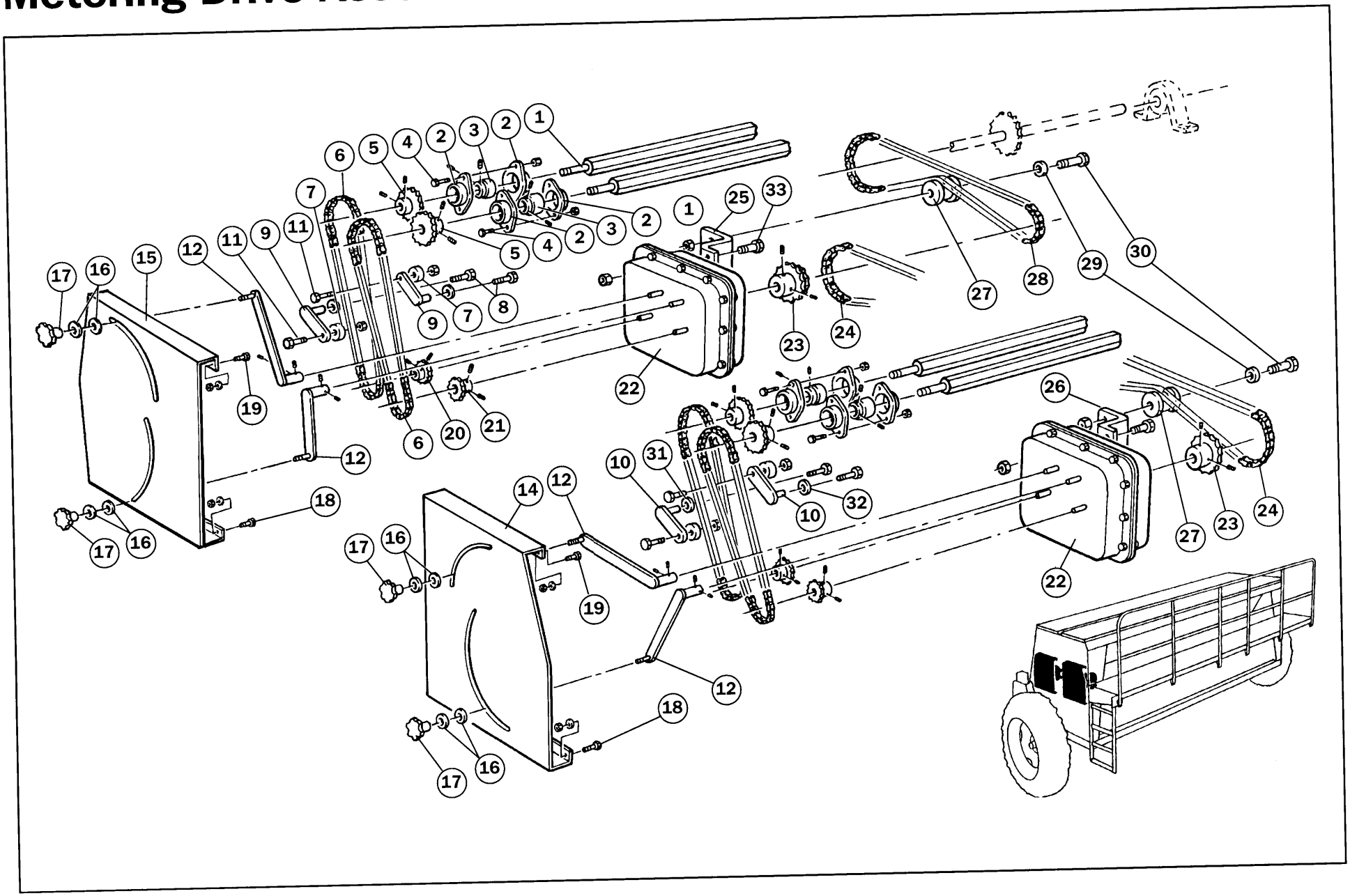
Right Hand Wheel Assembly



Right Hand Wheel Assembly Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	Cylinder Nipple	154-019	2	2	2	2
2	4/1/4"Cylinder	153-023	1	1	-	-
	41/2" Cylinder	153-024	-	-	1	1
3	1 set Depth Stop	164-000	1 set	1 set	1 set	1 set
4	Pivot Pin	113-4030	1	1	1	1
5	3" X 1" Bolt	133-2067	3	3	3	3
6	1" Nylock Nut	134-1081	3	3	3	3
7	210 Bearing Housing	138-052	2	2	2	2
8	FC210 Bearing	115-704	2	2	2	2
8	RH Wheel Arm Carrier	113-3014	1	1	1	1
10	21/2" X 5/8" Bolts	133-260	5	5	5	5
11	Top cylinder pin	113-4026	1	1	1	1
12	11/4"X 1/2" Bolt	133-170	1	1	1	1
13	RH Wheel Arm	113-2012	1	1	1	1
14	3" X 1" Bolt	133-2067	3	3	3	3
15	1" NylockNut	137-1081	3	3	3	3
16	Cat II Top Pin	140-001	1	1	1	1
17	Cat II Lynch Pin	140-039	1	1	1	1
18	3" X 5/8" Bolts	133-280	8	8	8	8
19	60mm External Circlip	136-1027	1	1	1	1
20	212 Bearing Housing	138-1032	2	2	2	2
21	FC212 Bearing	138-1042	2	2	2	2
25	AD95 Hub	113-3029	1	1	1	1
26	M18 X 60 Studs	115-717	6	6	6	6
27	M18 Wheel Nuts	115-716	6	6	6	6
28	M10 X 16 Grub Screws	131-2018	2	2	2	2
29	23/4" X 5/8" Bolt	133-270	3	3	3	3

Metering Drive Assemblies



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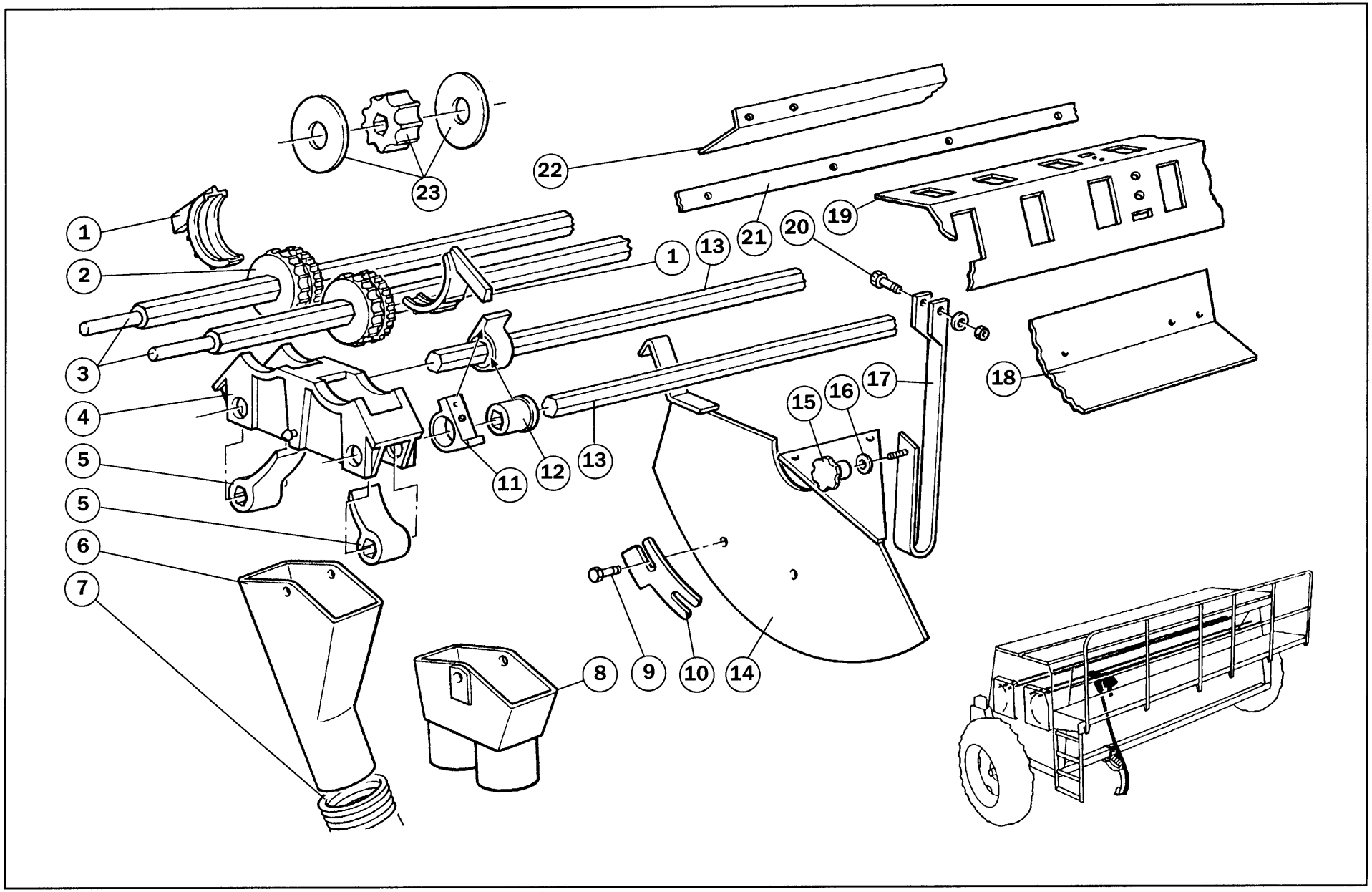
Metering Drive Assemblies Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	Roller Shaft	113-4032/20	4	-	-	-
		113-4032/24	-	4	-	-
		113-4032/28	-	-	4	-
		113-4032/32	-	-	-	4
2	Bearing Housing	115-707	4	4	4	4
3	Bearing	115-706	4	4	4	4
4	Bolt 5/16" UNC X 11/4"	133-050	8	8	8	8
5	Sprocket 2l T	115-420	4	4	4	4
6	Chain 08b1	115-709	1 box	1 box	1 box	1 box
7	Tensioner Roller	115-454	4	4	4	4
8	Bolt M12 X 35	133-150	4	4	4	4
9	Hex Shaft Chain Tensioner RH	115-210	2	2	2	2
10	Hex Shaft Chain Tensioner LH	115-211	2	2	2	2
11	Bolt 5/16 X 11/4	133-050	4	4	4	4
12	Varibox Lever RH	115-323	2	2	2	2
13	Varibox Lever LH	115-322	2	2	2	2
14	Varibox Quadrant Guard LH	115-117	1	1	1	1
15	Varibox Quadrant Guard RH	113-3037	1	1	1	1
16	Washer - Nylon	135-200	8	8	8	8
17	Hand Wheel M10 Thread	115-714	4	4	4	4
18	Bolt 5/16" X 1"	133-045	4	4	4	4
19	Bolt 3/8" X 1"	133-070	4	4	4	4
20	14T 1/2" Sprocket	115-421	2	2	2	2
21	15T 1/2" Sprocket	115-4018	2	2	2	2
22	Varibox	115-110	2	2	2	2
23	11/21T 5/8" Sprocket	113-4049	2	2	2	2
24	5/8" Box Chain	137-1058	1	1	1	1
25	Varibox Chain Tensioner Bracket	113-3059	1	1	1	1
26	Varibox Chain Tensioner Bracket	113-3060	1	1	1	1
27	Varibox Chain Tensioner Roller	113-4057	2	2	2	2
28	1/2" Box 5/8" Chain	137-1058	1/2 box	1/2 box	1/2 box	1/2 box
29	6mm Spacer	115-452	2	2	2	2
30	5/16" X 21/2 Bolt	133-1030	2	2	2	2
31	6mm Spacer Chain Tension	115-452	4	4	4	4
32	M12 Rubber Washers	135-190	4	4	4	4
33	5/16" x 2" Bolt	133-1029	4	4	4	4

Metering Mechanism Assembly

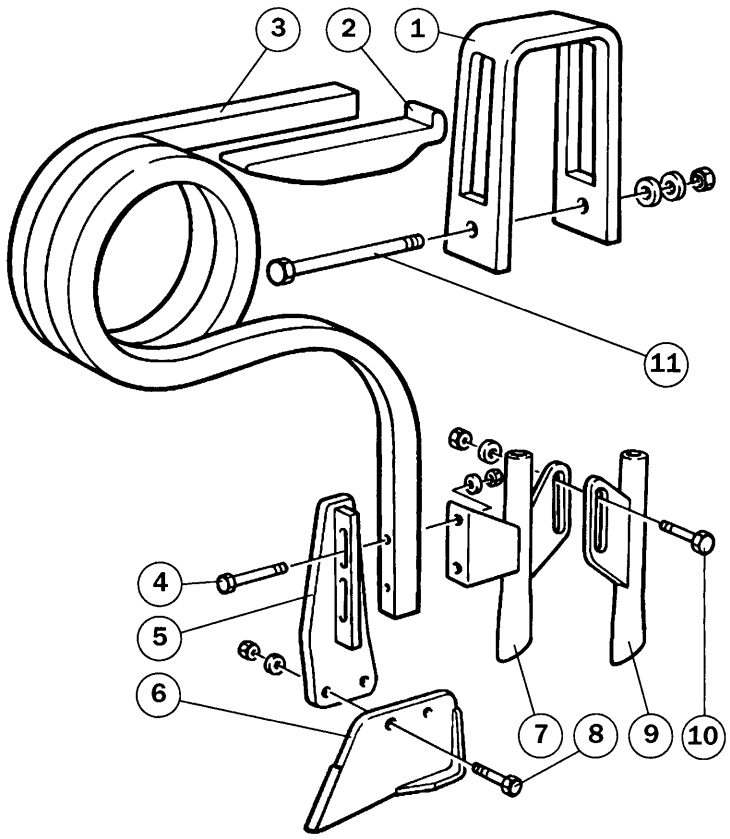


Metering Mechanism Assembly Parts List

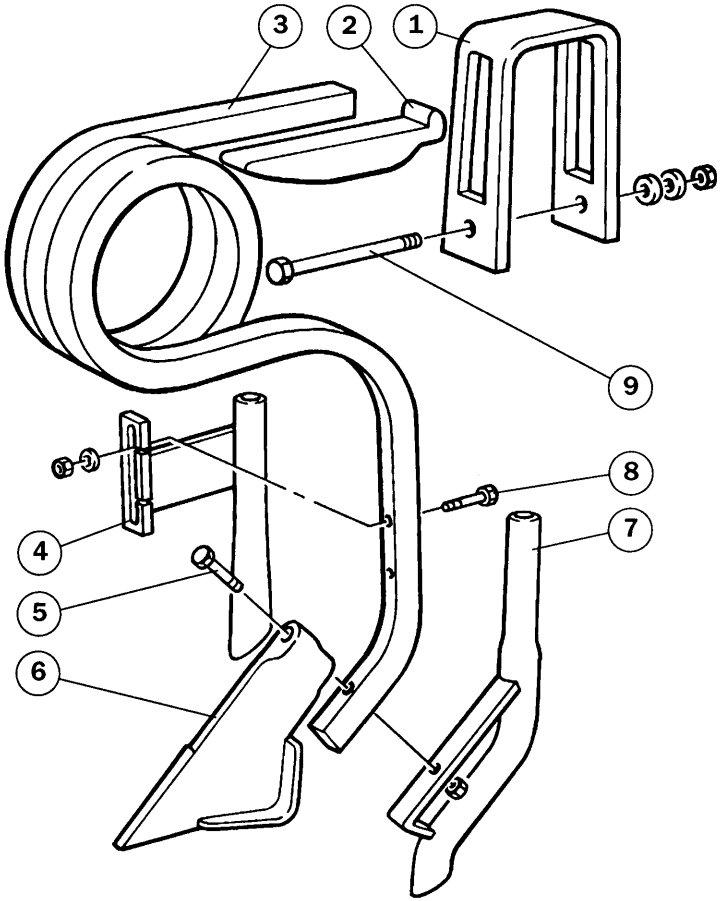
Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	Restrictor	115-401	120	135	160	160
2	Seed Roller	115-3001	104	128	152	176
3	Roller Shaft	113-4032/20	4	-	-	-
		113-4032/24	-	4	-	-
		113-4032/28	-	-	4	-
		113-4032/32	-	-	-	4
4	Roller Housing	115-2002	52	64	76	88
5	Gate	115-414	104	128	152	176
6	Feed Cup	115-112	20	24	28	32
7	Seed Hose	400-008				
8	Double Seed Cup	115-2024	20	24	28	32
9	Bolt 1/4" UNC X 1/2"	133-005	4	4	4	4
10	Gate adjustment slide	115-449	2	2	2	2
11	Bearing Housing	115-407	20	24	28	32
12	Insert	115-722	20	24	28	32
13	Gate Shaft	113-4031/20	4	-	-	-
		113-4031/24	-	4	-	-
		113/4031/28	-	-	4	-
		113/4031/32	-	-	-	4
15	Hand Wheel	115-714	2	2	2	2
16	Nylon Washer	135-200	2	2	2	2
17	Gate Lever	115-321	2	2	2	2
18	Verandah - outer	113-4033/20	4	-	-	-
		113-4033/24	-	4	-	-
		113-4033/28	-	-	4	-
		113-4033/32	-	-	-	4
19	Valley Sheet	113-2001/20	4	-	-	-
		113-2001/24	-	4	-	-
		113-2001/28	-	-	4	-
		113-2001/32	-	-	-	4
21	Restrictor Stop	113-4037/20	8	-	-	-
		113-4037/24	-	8	-	-
		113-4037/28	-	-	8	-
		113-4037/32	-	-	-	8
22	Verandah - Inner	113-4034/20	4	-	-	-
		113-4034/24	-	4	-	-
		113-4034/28	-	-	4	-
		113-4034/32	-	-	-	4
23	Bean Roller	114-4048	20	24	28	32

Standard & 700 Coil Tine Assemblies

Standard Coil Tine



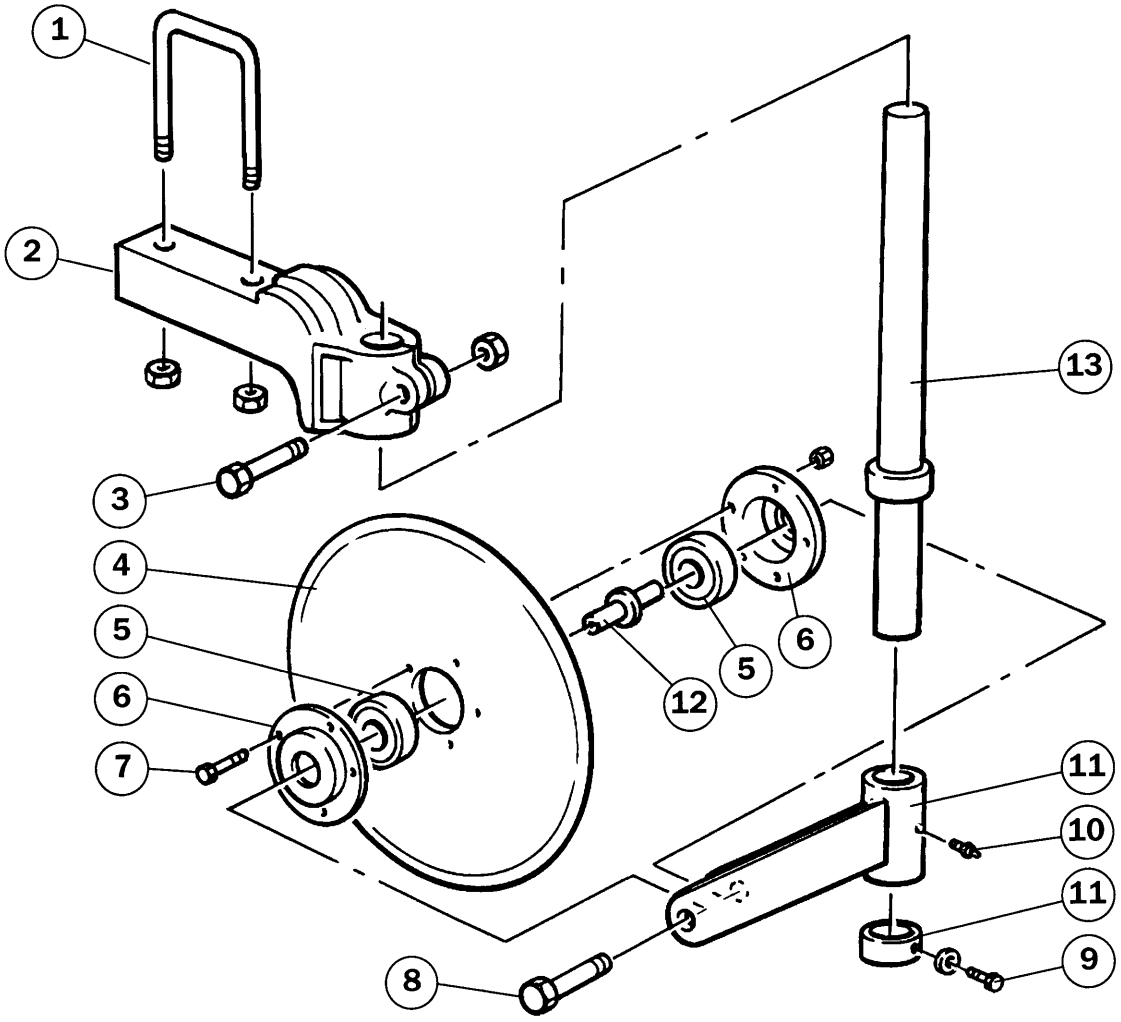
700 Coil Tine



Standard & 700 Coil Tine Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
	Standard Coil Tyne					
1	Clamp	115-309	20	24	28	32
2	Wedge	115-310	20	24	28	32
3	Coil Tyne RH	115-118	10	12	14	16
	Coil Tyne LH	115-119	10	12	14	16
4	1/2" X 21/2"	133-190	40	48	56	64
5	Boot Carrier	115-409	20	24	28	32
6	Boot	115-411	20	24	28	32
7	Tube	115-306	20	24	28	32
8	Bolt 3/8" X 11/4"	133-075	40	48	56	64
9	Tube	115-328	20	24	28	32
10	Bolt 3/8" X 1"	133-070	40	48	56	32
11	Bolt 5/8" X 8"	115-4002	20	24	28	32
	700 Coil Tyne					
1	Clamp	115-309	20	24	28	32
2	Wedge	115-310	20	24	28	32
3	Coil Tyne RH	115-3118	10	12	14	16
	Coil Tyne LH	115-3119	10	12	14	16
4	2nd Tube	114-3093	20	24	28	32
5	Bolt 1/2" X 21/2" Cup Head	133-1061	20	24	28	32
6	Boot	114-3100	20	24	28	32
7	Tube	114-3092	20	24	28	32
8	Bolt 5/16" X 2"	133-1029	40	48	56	64
9	Bolt 5/8" X 8"	115-4002	20	24	28	32

Coulter Assembly

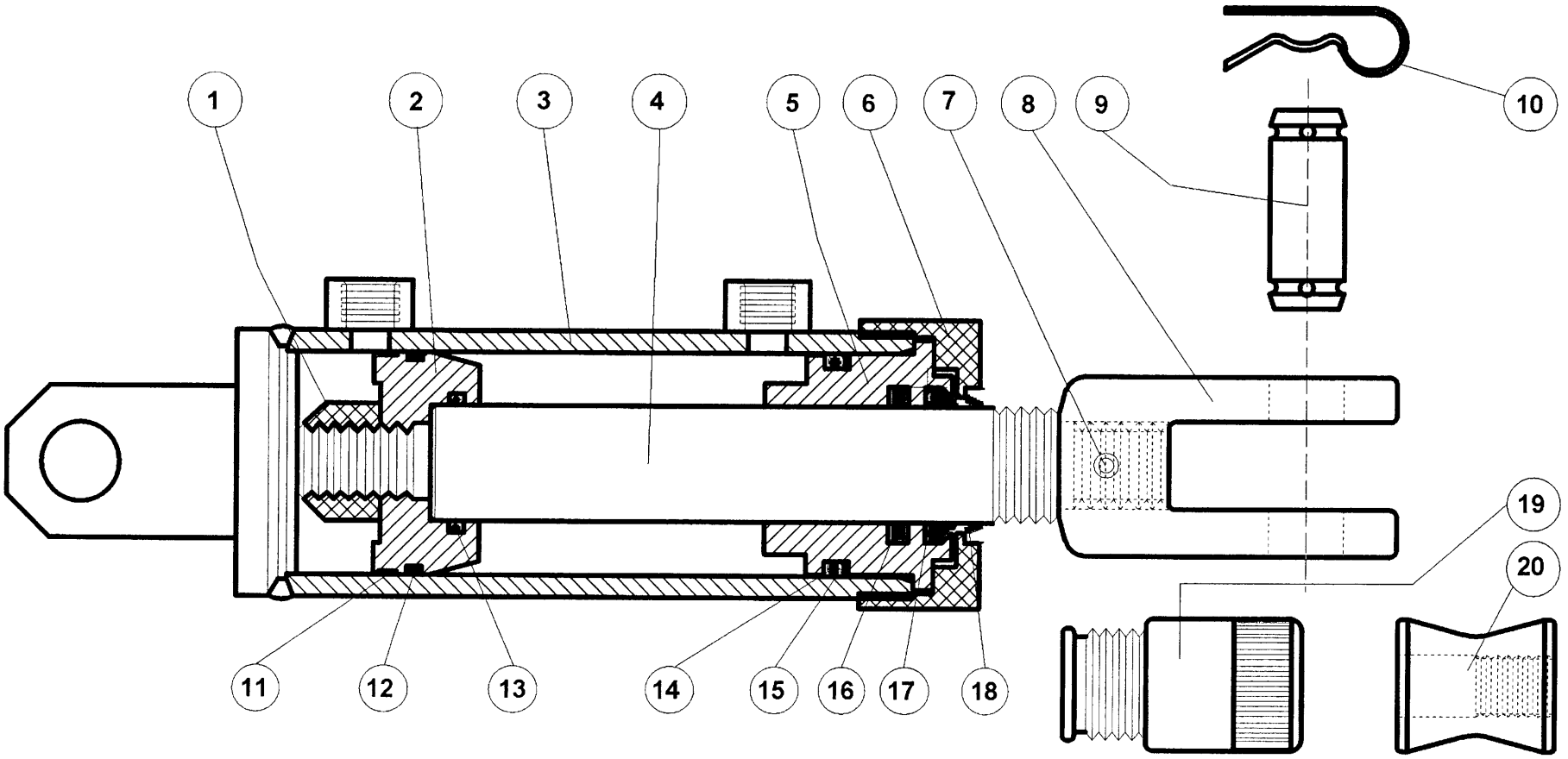


Coulter Assembly Parts List

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	U-Bolt 5/8" UNC	130-210	20	24	28	32
2	Bracket	111-315	20	24	28	32
3	Bolt M20 X 80	133-4063	20	24	28	32
4	Disc 14"	191-038	20	24	28	32
5	Bearings	138-031	40	48	56	64
6	Housing	138-030	40	48	56	64
7	Bolt 3/8" UNC X 1"	133-070	100	120	140	160
8	Bolt 5/8" UNC X 4"	133-300	20	24	28	32
9	Bolt 3/8" UNC X 1"	133-070	20	24	28	32
10	Grease Nipple	166-001	20	24	28	32
11	Collar	192-034	20	24	28	32
12	Sleeve	142-410	20	24	28	32
13	Shaft	192-028	20	24	28	32

Hydraulic Cylinder Assembly

PS Series Re-Phasing Cylinder Components



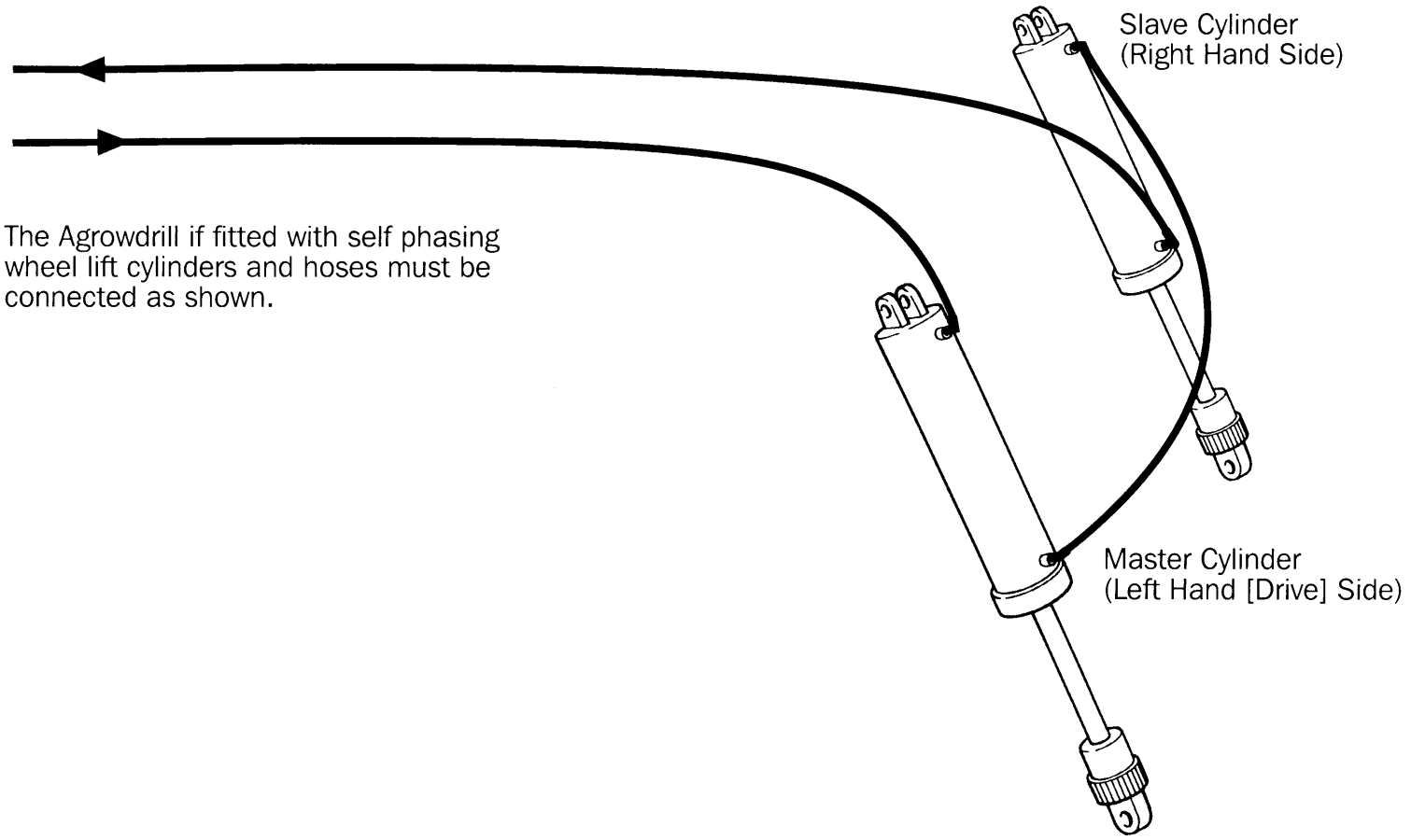
Hydraulic Cylinder Assembly Parts List

Item No	Description
	PS Series Re-Phasing Cylinder Components.
1	Nut
2	"PS" Piston
3	Barrel Assembly
4	"PS" Piston Galnd
5	"PH" Gland
6	"PH" Cap
7	Grub Screw & Keep
8	Rod Clevis
9	Pin
10	"R" Clip
11	Wear Ring
12	Piston Seal
13	"O" Ring
14	"O" Ring
15	Back Up
16	Glan Seal
17	Rod Wiper
18	Canned Wiper*
19	Mechanical Depth Stop
20	Fixed Depth Stop
21	Seal Kit**
*	Note: Canned Wiper is not included in Seal Kits - Order separately.
**	Seal Kits include: Items 11, 12, 13, 14, 15, 16 & 17.

Alford Cylinder Part Number	Alford Seal Kit Description
PS30A08	PS300 Seal Kit
PS325A08	PS325 Seal Kit
PS35A08	PS350 Seal Kit
PS375A08	PS375 Seal Kit
PS40A08	PS400 Seal Kit
PS425A08	PS425 Seal Kit
PS45A08	PS450 Seal Kit
PS475A08	PS475 Seal Kit
PS50A08	PS500 Seal Kit

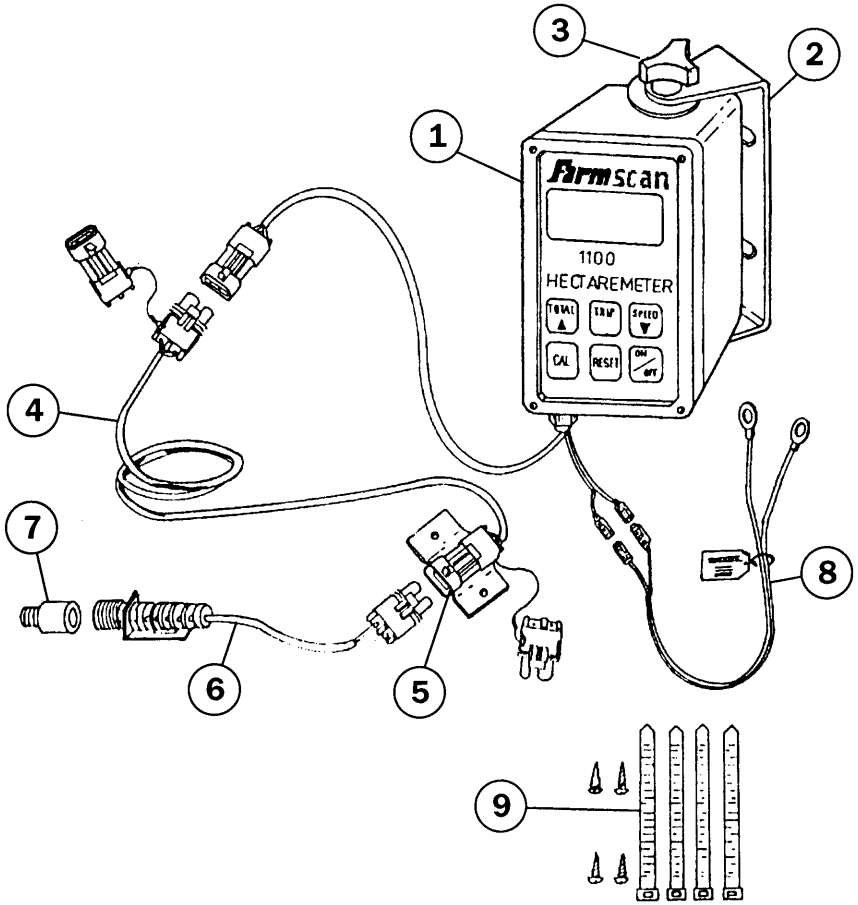
Note: The last two digits of the Cylinder Part Number can change as they nominate the stroke length of the cylinder, ie. 08 = 8" stroke, 12 = 12" stroke, 24 = 24" stroke, etc.
The Seal Kit Number remains the same, however, irrespective of the stroke.

Hydraulic Plumbing Diagram



The Agrowdrill if fitted with self phasing wheel lift cylinders and hoses must be connected as shown.

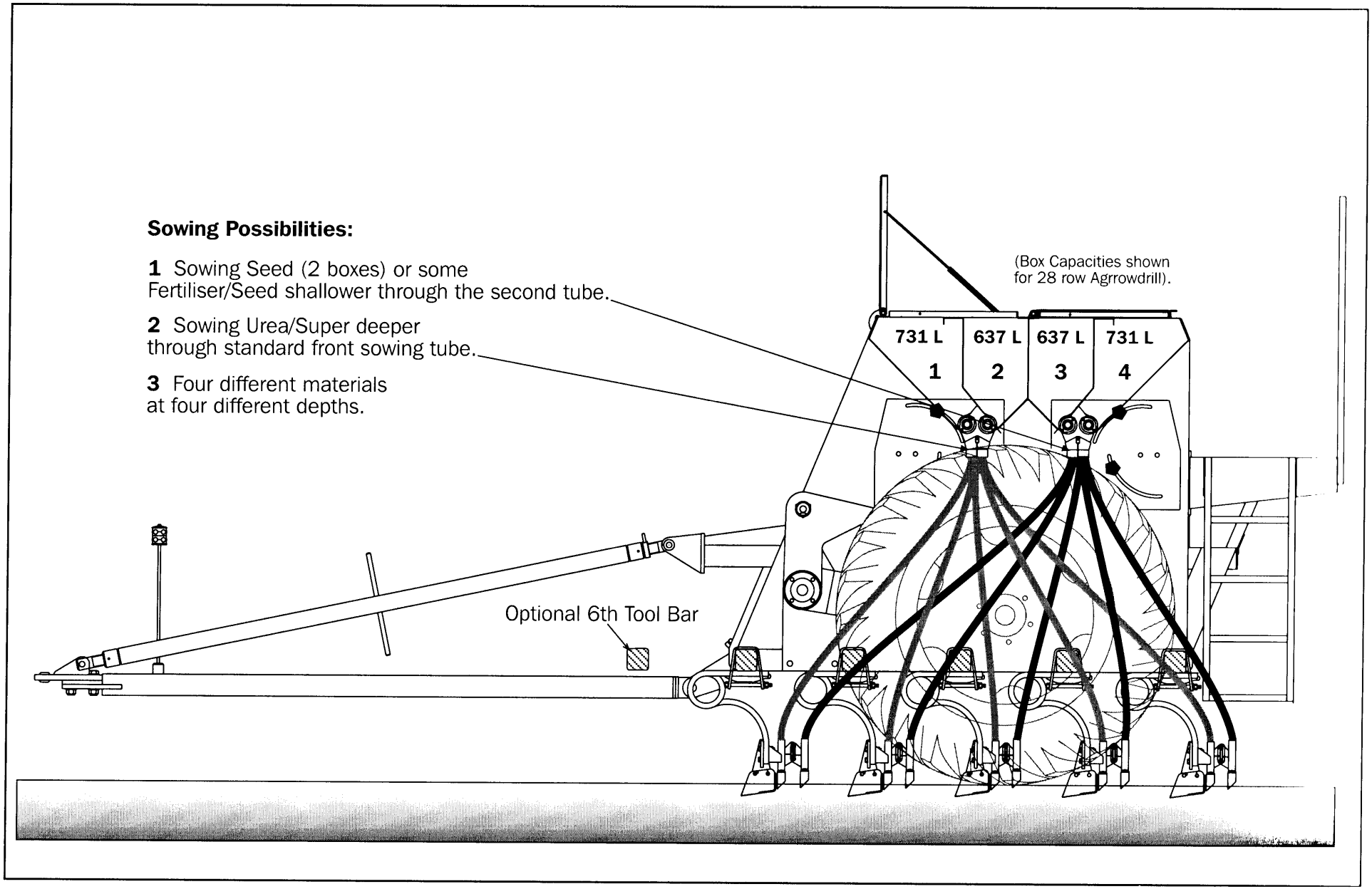
Hectaremeter Assembly & Parts



Component List - 1100 Hectoremeter Kit1

REF	PART No.	DESCRIPTION	QTY
1	A-1100	12 HECTAREMETER UNIT	1
2	AH-409	MOUNTING BRACKET (small)	1
3	AH-861	SECURING KNOBS	2
4	AC-205	5m 2 WAY SENSOR CABLE	1
5	AH-400	CABLE MOUNTING BRACKET	1
6	AA-110P	REED TYPE SENSOR	1
7	AA-132	WHEEL MAGNET	1
8	AC-1 01	8m POWER CABLE	1
9	AH-408	UNIVERSAL HARDWARE PACK	1
	HG-706	CABLE TIES 290 x 5mm	10

AD95 Sowing 5 Row Configuration



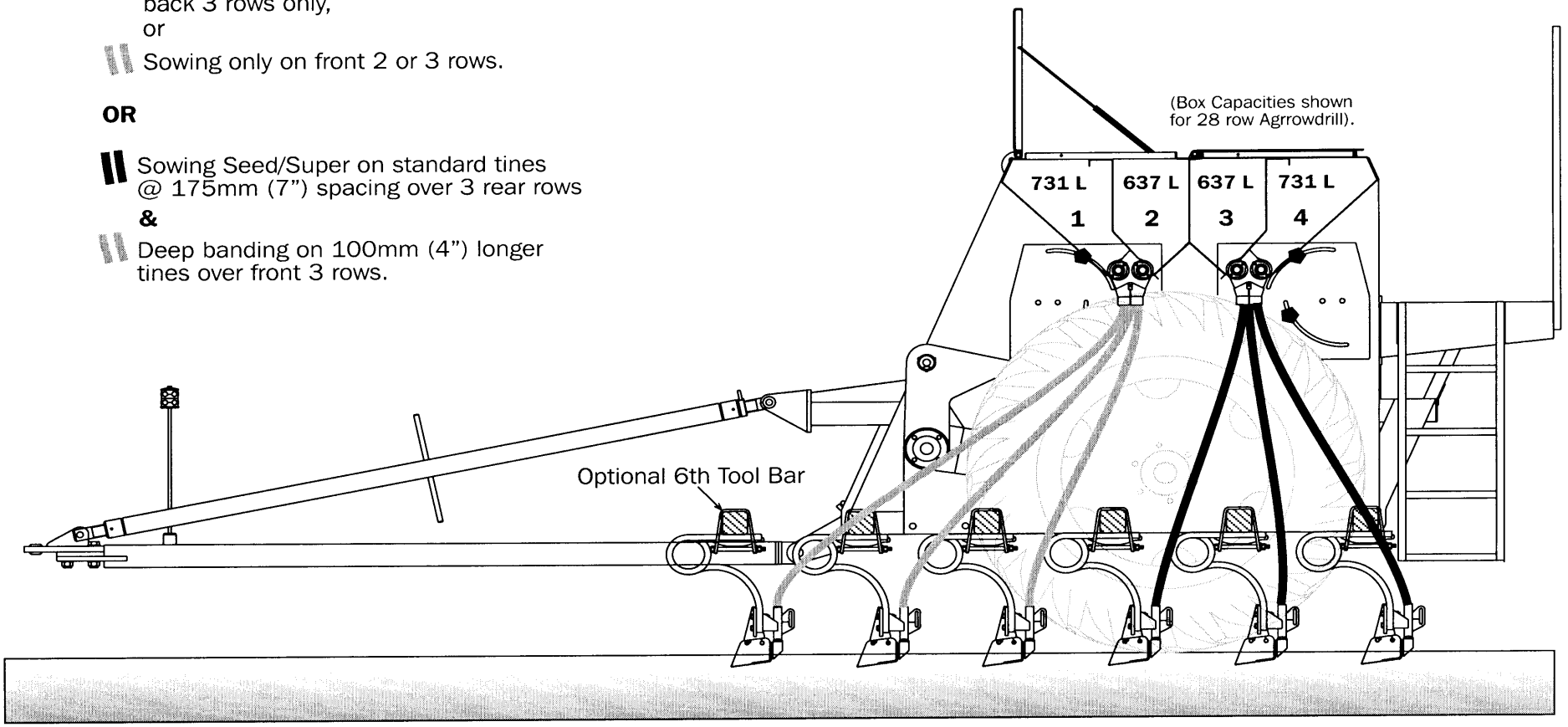
AD95 Sowing 6 Row Configuration

Sowing Possibilities:

- Sowing Seed/Super on back 3 rows only, or
- Sowing only on front 2 or 3 rows.

OR

- Sowing Seed/Super on standard tines @ 175mm (7") spacing over 3 rear rows
  &
- Deep banding on 100mm (4") longer tines over front 3 rows.



Decals

WARNING
READ OWNERS MANUAL
INSTRUCTIONS CAREFULLY
BEFORE OPERATING
THIS MACHINE

6

WARNING
CHECK AND TIGHTEN
ALL NUTS AND BOLTS
AFTER FIRST HOUR
OPERATION. THEN AFTER
EVERY 30 HOURS OF USE.

7

DANGER
KEEP GUARDS ON
AT ALL TIMES

9

DANGER
DO NOT RIDE
ON MACHINE
SERIOUS INJURY
COULD OCCUR

1

DANGER
DO NOT WORK UNDER
MACHINE WHEN IN
RAISED POSITION

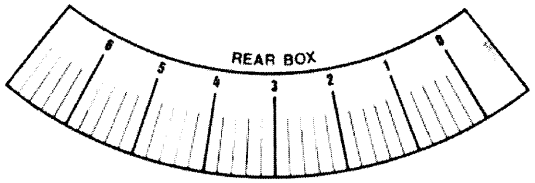
8

Quality System
Quality
Endorsed
Company

ISO 9001 LIC 6087
Standards Australia

Manufactured under a quality system certified as complying with ISO 9001 by an accredited certification body.

3



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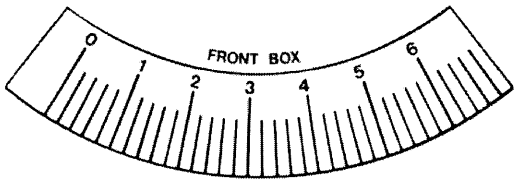

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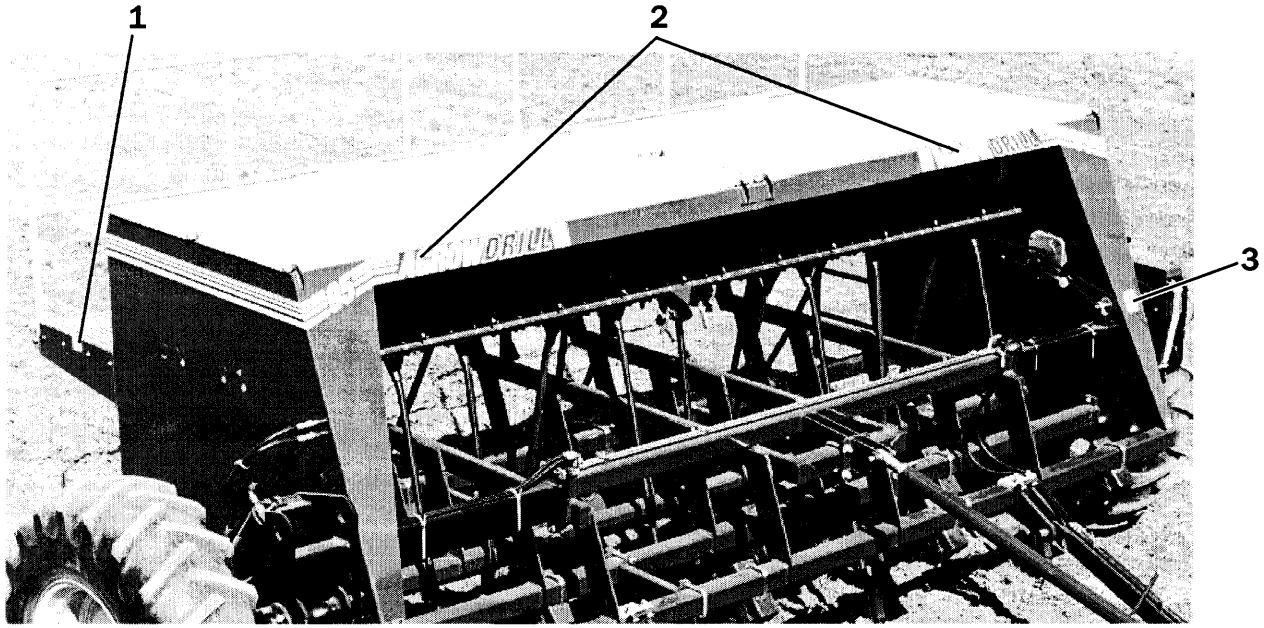

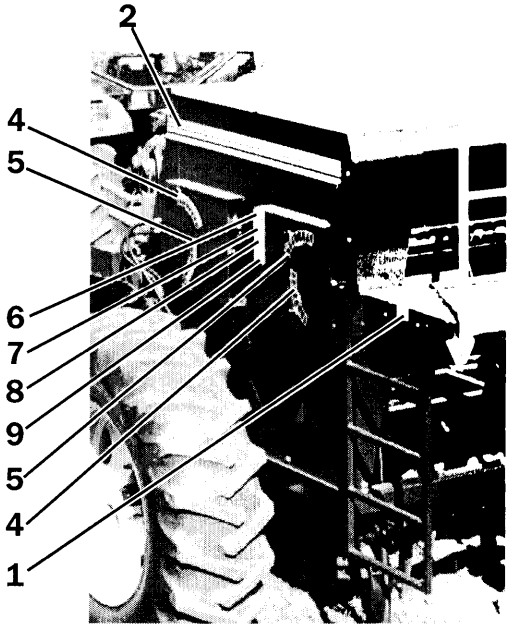

Decals

Item No	Description	Part Number	Quantity 20 Row	Quantity 24 Row	Quantity 28 Row	Quantity 32 Row
1	DANGER Do Not Ride On Machine ...	600-4211	2	2	2	2
2	Logo, Agrowdrill 95 & stripes	600-5113	2	2	2	2
3	Quality Endorsed Company	600-4110	1	1	1	1
4	Rear Box Lever Calibration	115-3026	2	2	2	2
5	Front Box Lever Calibration	115-3025	2	2	2	2
6	Warning Read Owners Manual ...	600-4215	1	1	1	1
7	Warning Check and Tighten Bolts & Nuts	600-4212	1	1	1	1
8	Do Not Work Under Machine	600-4213	1	1	1	1
9	DANGER Keep Guards On ...	600-4214	1	1	1	1

AGROWPLOW

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Prosperity through Soil Care