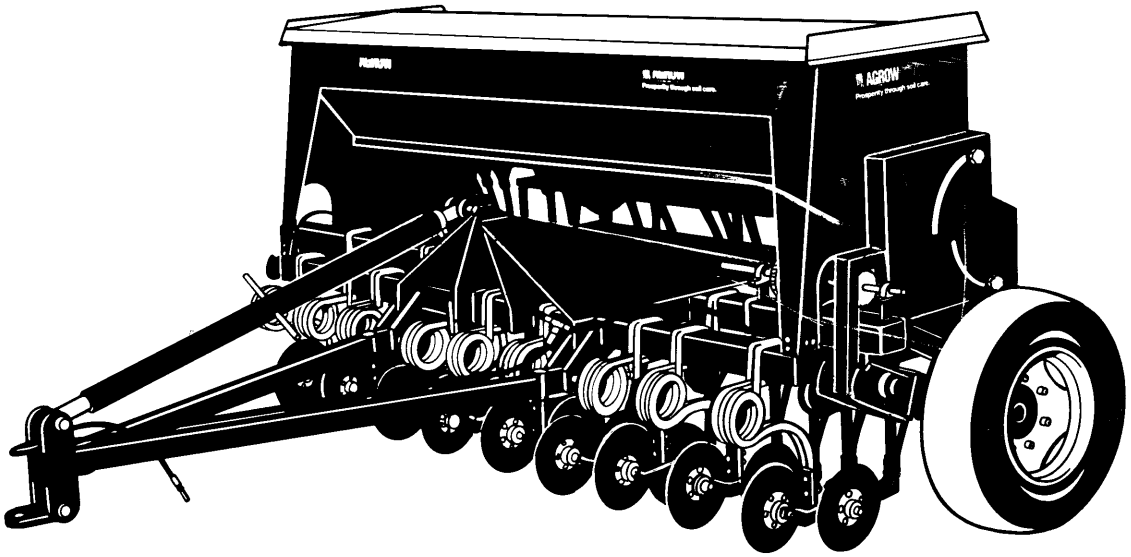
AGROWPLOW®

AUSTRALIAN **SOIL CARE** SYSTEMS PTY. LTD.



AGROWDRILL™

Owners Manual and Spare Parts

Part No. 600-401

AGROWPLOW PLAIN ENGLISH WARRANTY

WE AT AGROWPLOW STAND BEHIND OUR PRODUCTS AND WE ARE INTERESTED IN YOUR SATISFACTION.

THIS WARRANTY REGISTRATION FORM IS VITAL FOR US TO ENSURE THAT YOU ARE COMPLETELY SATISFIED!
Please fill in the details below.

Model:_____ **Serial No.:**_____

Attachments:_____

_____

Purchased by:- Name:_____

Address:_____

_____**Phone:**_____

Date purchased:_____/_____/_____ **Owners Signature:**_____

Dealer:_____

Date of pre-delivery:_____/_____/_____ **Dealer Signature:**_____

NOTE:- White copy - retained by dealer
Yellow copy - retained by owner
Buff copy - Send to Agrowplow, Wellington.

CONDITIONS OF THE WARRANTY.

Agrowplow (Australian **Soil Care** Systems Pty. Ltd.) warrant machines manufactured at Wellington for a period of twelve (12) months from the date of purchase.

The warranty covers:-

- Replacement of specified parts **(see below)** which fail under normal operating conditions within Australia.
- The labour costs of any warranty replacements.
- Faulty parts and workmanship as supplied by the original manfacturer.

The warranty DOES NOT cover:-

- Ground engaging tools or tyres and tubes.
- Replacement of parts damaged through misuse or neglect. (Under normal circumstances)
- Repair or replacement of parts without the authorisation of an Agrowplow representative.
- Any freight costs incurred in supplying replacement parts.
- Loss of income, costs of hiring substitute machinery or any losses incurred due to delayed harvests, resulting from breakage.
- Failure due to unauthorised modification of the Agrowplow.

THE OWNER is responsible for the regular service & maintenance of the Agrowplow. Warranty is void by using an Agrowplow beyond it's designed limits.
THE DEALER is responsible for the correct assembly and pre-delivery of the Agrowplow and for the prompt processing of legitimate warranty claims.

AN AGROWPLOW representative must approve any replacement of parts. Parts repaired or replaced without authorization WILL NOT be covered by warranty.

This warranty includes all necessary conditions of the Trade Practices Act, 1974 and any conditions required by state laws.

AGROWDRILL PRE DELIVERY CHECK LIST

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 Blanking Off Cap locating strip adjusted firmly against Blanking Off Cap supporting leg.
OK ☐ NO ☐ 1.4 Check nuts fixing Gas Strut
OK ☐ NO ☐ 1.5 Quadrant Handle secured to Hex Shaft
OK ☐ NO ☐ 1.6 Zero gap between Gate and Roller when Adjustment lever zero to setting one.
OK ☐ NO ☐ 1.7 Check Hopper to Frame mounting bolts for tightness
OK ☐ NO ☐ 1.8 Hopper clean of any debris.

2.O - WHEEL ASSEMBLIES.

OK ☐ NO ☐ 2.1 Check Wheel Nuts
OK ☐ NO ☐ 2.2 Tyre Pressures (See manual for pressures)
OK ☐ NO ☐ 2.3 Tighten all nuts on bearing housing - 8 nuts
OK ☐ NO ☐ 2.4 Grease Bearings - 2 per assembly
OK ☐ NO ☐ 2.5 Check and tighten Wheel Carrier Beam - 2 x 5/8" H.T. & 1 x 5/8" U Bolt
OK ☐ NO ☐ 2.6 Check and Grease Adjustable Depth Collar
OK ☐ NO ☐ 2.7 Both Wheels adjusted to the same depth
OK ☐ NO ☐ 2.8 Ram Location Pins secure.

3.0 - DRIVE.

OK ☐ NO ☐ 3.1 Check, seat & tighten Main Drive Sprocket on Wheel axle.
OK ☐ NO ☐ 3.2 Align all sprockets.
OK ☐ NO ☐ 3.3 Check chain tension - deflection 5mm - 8mm with hand pressure.
OK ☐ NO ☐ 3.4 Maximum of 6mm shims on the lay shaft.
OK ☐ NO ☐ 3.5 Lay shaft Sprocket Grub Screws positioned in the keyway.
OK ☐ NO ☐ 3.6 Chain Guards secure.
OK ☐ NO ☐ 3.7 Varibox Sprockets secure.
OK ☐ NO ☐ 3.8 Varibox filled to correct level with motor oil.
OK ☐ NO ☐ 3.9 Check for oil leaks.
OK ☐ NO ☐ 3.10 Varibox mounting bolts secure.
OK ☐ NO ☐ 3.11 Rate adjusting levers running freely in the slots.
OK ☐ NO ☐ 3.12 Levers seated and fastened to shafts.
OK ☐ NO ☐ 3.13 Quadrant scale zero.
OK ☐ NO ☐ 3.14 Friction rubber/nylon washer placed under hand nut.

4.0 - UNDER CARRIAGE.

OK ☐ NO ☐ 4.1 All tines straight.
OK ☐ NO ☐ 4.2 Tines evenly spaced.
OK ☐ NO ☐ 4.3 Tine clamps firmly tensioned.
OK ☐ NO ☐ 4.4 Tines Split Pins positioned.
OK ☐ NO ☐ 4.5 All tines perpendicular to the toolbar.
OK ☐ NO ☐ 4.6 Opener, sowing tube orientation square and vertical with tine.
OK ☐ NO ☐ 4.7 Owner / operator advised to re-tension main tine clamps after 30 minutes of operation.
OK ☐ NO ☐ 4.8 All soil openers must align with coulters.
OK ☐ NO ☐ 4.9 Check all coulter bolts tension.
OK ☐ NO ☐ 4.10 Coulters vertical and square to carrier.

5.0 - HYDRAULICS & FRAME ASSEMBLIES.

OK ☐ NO ☐ 5.1 All connections pressure tested for leaks.
OK ☐ NO ☐ 5.2 Operator advised that the flow divider valve requires 16 l/minute flow rate and clean oil.
OK ☐ NO ☐ 5.3 Levelling tube greased and checked for free rotation.

DECLARATION

1. I, the Authorised Agrowplow Dealer, have services 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 _____ Date: ___/___/_____

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THE AGROWPLOW FARMING SYSTEM

WHY WAS THE AGROWDRILL DEVELOPED?

Most Australian soils are extremely fragile.

We have damaged our soil immeasurably in a few brief decades under cultivation. Traditional approaches to "seedbed" preparation and seeding are not suitable for our Australian soils and environment.

The soil is your most important economic resource.

Looking after your soil is 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's happening to your soil?

Most of the degradation of our soil results from:-

1/ The traditional farming techniques used.
Most of the cultivation and seeding techniques used in Australia are imported directly from Europe and North America. Our soils and climate are vastly different - and the techniques needed to farm and conserve them are also different.

2/ Static commodity prices and soaring costs.
Many farmers have been forced to farm much more intensively to meet the challenge of the "cost - price squeeze". They have been forced to exploit their soils to remain viable in the **short term.**

What will this leave for the next generation?
Will the soil still be productive for their children and for Australia?

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 guidelines that will help. These are:-

1/ Less cultivation - "direct drilling".
2/ Less inversion of the soil - "Agrowplowing".
3/ Maintenance of decaying crop and pasture residues on the soil surface.
4/ Encourage 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, as part of the Agrowplow Farming System, was developed to help you do this!

HOW DOES THE AGROWDRILL FIT INTO THE AGROWPLOW FARMING SYSTEM?

The "Rootbed"

The basic idea behind the Agrowplow farming system is to promote a healthy climate for the most neglected part of all crops and pastures - the roots! We use the term "Rootbed" rather than the traditional term "seedbed", to describe the environment the Agrowplow system helps create.

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) Particles are joined together into "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.

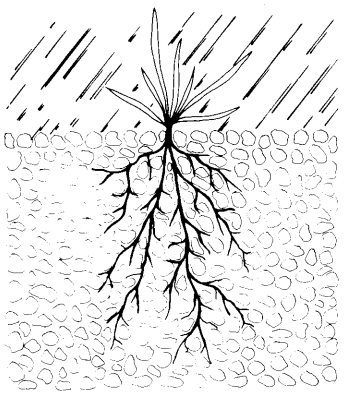


Figure 1

Soil with poor structure does not have well developed "aggregates". Soil particles separate. Clay soil can then 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. A sandy 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 main type of degradation affecting soils in the cropping districts of Australia. Structural degradation is now causing more economic loss than more obvious sources 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 tyned 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 a "hard pan" - a compacted layer under the soil surface which is impervious to moisture and plant roots. (See figure 2)

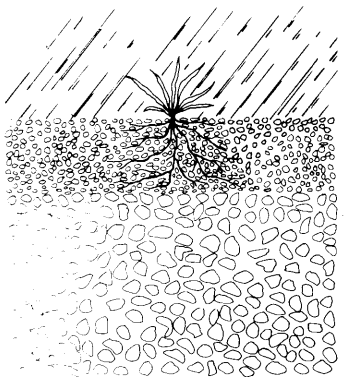


Figure 2

Another major cause of soil compaction in a pasture situation is stock and vehicle traffic. During the life of a pasture the soil may be compacted by stock movements - especially during wet weather. This will reduce the productivity of the pasture significantly.

HOW DOES THE AGROWPLOW FARMING SYSTEM HELP PREVENT SOIL DEGRADATION?

1/ Less cultivation - "direct drilling".

Your Agrowdrill is designed from the ground up to perform well direct drilling into 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 tyned and disc implements invert the soil to some extent. 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 your Agrowdrill does not require removal of surface trash cover. Your Agrowdrill is designed to handle large quantities of surface trash.

4/ Encourage moisture penetration and root growth.

Maintaining surface trash cover and reducing compaction will ensure this.

5/ Decompaction and reduced Bulk Density of the "Rootbed".

Using an Agrowplow to decompact and aerate the soil will help to improve moisture penetration and soil organism activity.

6/ Timely and accurate seeding of pastures and crops.

Direct drilling using your Agrowdrill will allow you to seed ON TIME after rain, without having to wait for cultivated soil to dry out sufficiently to work. Your Agrowdrill is designed to ACCURATELY place seed and fertilizer into uncultivated soil or cultivated soils.

WHAT'S SPECIAL ABOUT YOUR AGROWDRILL?

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

- extremely rugged construction and plenty of weight to penetrate the soil.
- unique walking beam coulter design.
- very strong coil tines with a high breakaway force which maintains the digging angle of the ground tools.
- the use of Inverted "T" (Baker Boot) soil openers

What advantages does the Baker Boot have over the alternatives?

The Baker Boot.
The Baker Boot opener is capable of producing the ideal environment for seed germination. As Figure 3 shows, the seed is placed at the bottom of a narrow slot into moist soil. The narrow slot and minimal surface disturbance ensures minimal moisture loss and soil erosion risk. There is little "smearing" of the soil as the opener passes. The Baker Boot has no moving parts and the very narrow profile gives lower draft requirements, easier penetration and less wear.

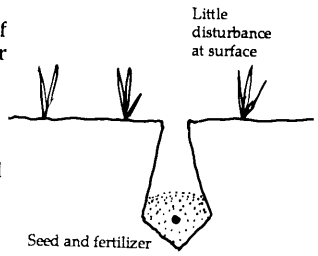


Figure 3

The action of the Baker Boot is quite different to the four other main types of soil openers used in direct drills.

Triple Disc and Twin Disc.
These openers use discs. 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 fertilizer 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.

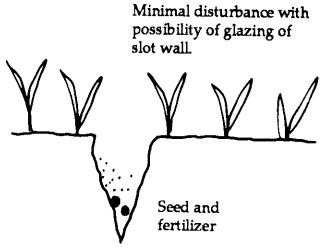


Figure 4

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" the sides of the slot
- do not always put the seed into loose soil
- require a great deal of weight to penetrate the soil.

Single Disc
Single disc soil openers use only one disc. The disc, which is dished, is mounted at an angle to the direction of travel, slicing the soil and throwing it to one side. The seed is dropped in the furrow created by the disc and is covered by soil falling back into the furrow. (See figure 5)

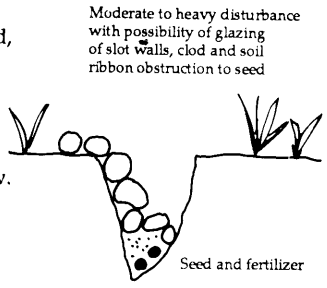


Figure 5

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 soil 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

Conventional Tines
Conventional tyned 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.

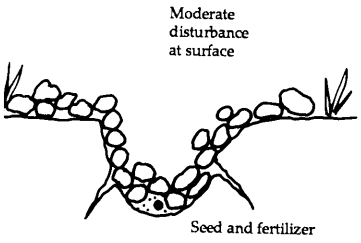


Figure 6

The disadvantage of conventional tines are as follows:-

- poor trash handling ability.
- 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 moving the soil up and to the side
- the digging tools often have a high wear rate
- the need to 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 your Agrowdrill you must think about seeding in a new way.

SEEDING - THE MOST IMPORTANT JOB YOU DO ALL YEAR.

Your aim when seeding is 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 important thing. The following diagrams illustrate what you should be trying to achieve:-

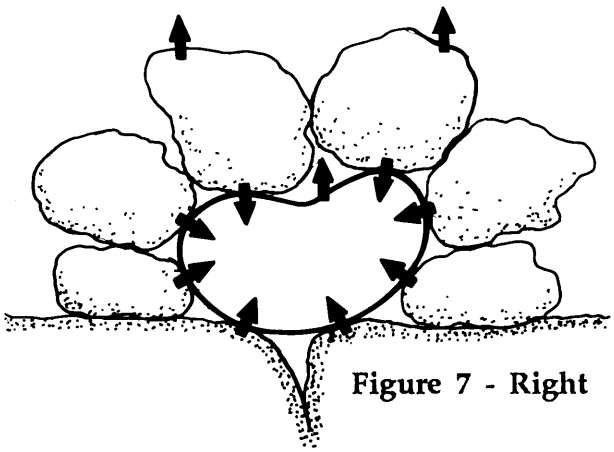


Figure 7 - Right

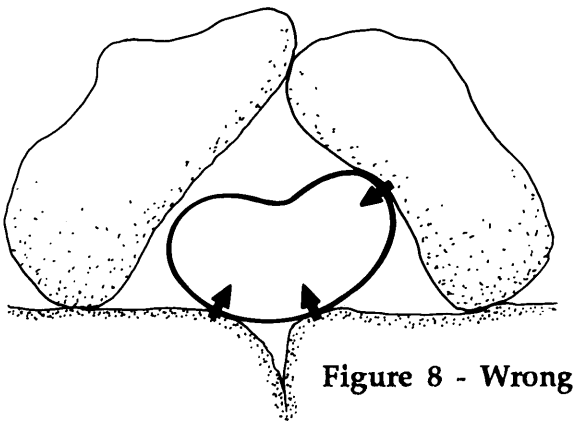


Figure 8 - Wrong

PRINCIPLES OF DIRECT SEEDING

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 cultivation of the soil - to physically cut the roots of unwanted plants. Direct drilling calls for a different approach. Some options for weed control are:-

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

2/ Timing

Timeliness of the seeding operation is critical for good results. There are two main aspects of timeliness you must consider:-

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

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 loosely related to seed size. Small seeds generally need to be placed shallow. Your Agrowdrill is capable of placing seed accurately at any depth down to 75mm (3 inches). Ask your seed supplier or advisory officer how deep you should be sowing and adjust your Agrowdrill accordingly.

Your Agrowdrill can be set up to seed in either 127mm (5 inch) rows, 175mm (7 inch 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 nutrition. Most Australian soils are low in fertility and need to have fertilizer applied to boost pasture and crop growth. Young plants especially need good nutrition.

The need for fertilizer can be assessed in a number of ways:-
- paddock history
- the vigour of existing vegetation
- chemical soil tests
- trial plots

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

Fertilizers are available in many different forms and can be applied in many different ways. Your Agrowdrill can "band" artificial fertilizers accurately 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 is a great deal of careful management needed after your Agrowdrill has given your seed the best chance of establishment.

Weed Control.

Effective weed control can be the difference between a profit and disaster. Good weed control before seeding will give the emerging seedlings a good start. Certified seed, adequate fertility, correct seeding rates and placement of seed will put the odds in your favour for good germination and emergence. However, management practices after emergence are just as important.

Inspect your crop or pasture regularly for weed growth. If weeds become a problem you have a number of option open to you:-

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

Insect Pest Control.

Insect pests can seriously damage emerging and 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 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 Fertilizer

Maintaining good nutrition is important for sustained production. All crop and pastures can benefit in some situations from additional fertilizer after seeding. Fertilizer 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.

USING YOUR AGROWDRILL

BEFORE YOU START..... Your Agrowdrill should be matched to your tractor size to ensure maximum performance. A mismatched tractor and implement will be inefficient and will cost YOU money.

Three Point Linkage models:- Drawbar kilowatts should usually not be a limiting factor. With three point linkage machines, however, your tractor's lift capacity may be limiting. Check your tractor's operators manual for details.

Your Agrowdrill is designed for category Two 3 point linkage. If your tractor is equipped with Category One linkage you will need to use bushes with the linkage pins. These are available from your Agrowplow Dealer.

It is ESSENTIAL your tractor be front weighted while using your Agrowdrill. Your Agrowdrill is very heavy when the hoppers are filled and WILL transfer weight off the front wheels. This can be dangerous, particularly when travelling at speed on the road Consult your tractor's operating manual for recommendations.

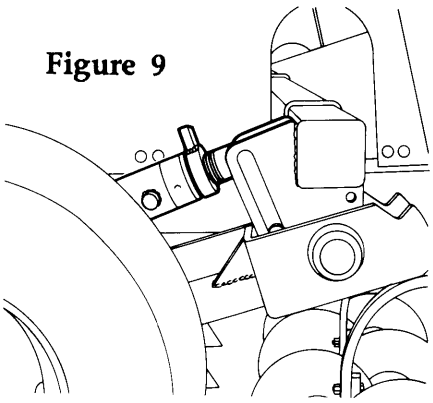


Figure 9

Approximate minimum tractor power requirements are as follows:-

9 Row	13 Row	18 Row
40kw	55kw	70kw
(54hp)	(74hp)	(94hp)

SETTING UP

1. HITCHING UP AND LEVELLING. Your Agrowdrill MUST be adjusted level to do its job properly. It must be level WHILE OPERATING. Use the following procedures for adjustment:-

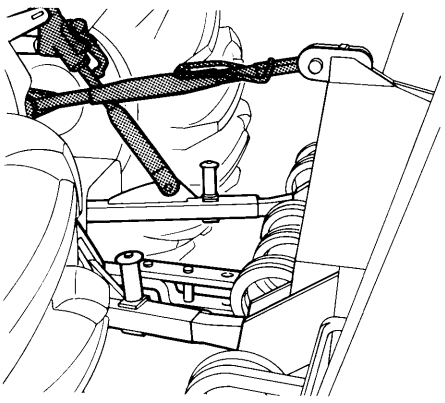


Figure 10

Three Point Linkage models:-

1/ Attach and level your Agrowplow laterally (side to side) using the screw adjustable linkage arm. (See figure 10)

2/ Set both depth wheels EVENLY at the desired working depth and tighten the locking collar or retaining bolt firmly. (See figure 9)

3/ Set the fore - aft level to approximately correct using the adjustable top link. (See Figure 10) **Front and rear depth MUST be equal.**

4/ Start working at the desired depth and observe the level of the machine FROM THE SIDE AND REAR. Readjust and repeat the above procedure if necessary. Retighten the locking collar on the top link when you have finished adjustments.

Trailing models:- The working depth of a trailing Agrowdrill is controlled by the hydraulic rams attached to the wheel assemblies. These are operated by your tractors remote hydraulic system. The two rams are connected to your tractor through a valve which ensures they work together in parallel.

Hitching and levelling procedure is as follows:-

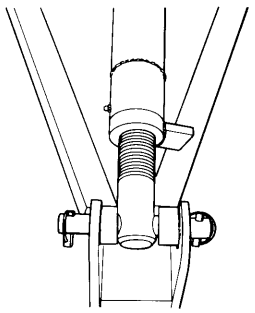


Figure 11

1/ Pin the drawbar into the central position.
2/ Attach your Agrowdrill to the drawbar and set the adjustable top link (see figure 11) so that the machine is approximately level.
3/ Attach the hydraulic coupling to your tractors remote outlet, taking care to clean away any dirt. 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.
4/ Lift the machine to the highest position. This will fully extend both hydraulic rams and ensure they are "phased" properly.
5/ Adjust depth collar fitted to the end of the hydraulic cylinder to maximum desired depth. These stops will ensure positive depth control.
6/ Start working at the desired depth and observe the level of the machine FROM THE SIDE AND REAR. Adjust the top link on the hitch "A" frame so that your Agrowdrill is level from front to rear. Retighten the locking collar on the top link when you have finished adjustments.

NOTES:- It is VERY important that you level your Agrowdrill correctly to achieve good results. As a final check on the level 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.

Tyres:-
On both linkage and trailing models, check that both tyres are inflated to **350 - 490kPa (50 - 70psi) for 13 and 18 Row, 315 kPa (45psi) for 9 Row.** A low tyre will allow one side of the machine to dig deeper.

Three Point Linkage Stabiliser bars or chains:-
You must use these at all times. This is particularly important if you are using coulters. Adjust the stabilisers to bring your Agrowdrill directly behind the tractor, allowing only slight side to side movement.

What hydraulic setting should you use:-
You should operate your tractor Three Point Linkage System in the "Float" mode, allowing your Agrowdrill to be supported by the depth wheels and follow the ground contours. Consult your tractor manual for details.

2 AT WHAT DEPTH SHOULD YOU SEED?

Seeding depth will vary depending on the species being sown. Small seeded species have generally 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 topsoil will tend to dry out rapidly and lead to poor germination.
- in wet, cool conditions the topsoil will remain moist and shallow placed seed to germinate effectively.

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

3 WHAT ROW SPACINGS SHOULD YOU USE?

Your Agrowdrill can be set up to seed in either 127mm (5 inch) rows, 175mm (7 inch 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.**

Your Agrowdrill can be set up as either two rows or three rows of seeding tines, with or without coulters. Using your Agrowdrill as a three row machine allows greater clearance between the tines in conditions where you don't need to use coulters. (For details of setting up your Agrowdrill with coulters AND three rows of seeding tines, see the Optional Equipment section, page 26)

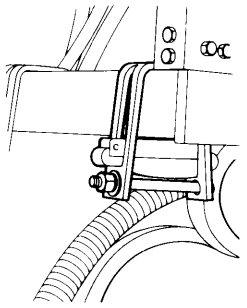


Figure 12

Your Agrowdrill is delivered with a standard tine setup of two rows of seeding tines on 175mm spacings. The procedure for adjusting row spacings to non-standard is as follows:-

Two Row with 127mm spacing:-

1/ Purchase extra tine/opener/downtubes assemblies and extra coulter assemblies from your Agrowplow dealer. These are available as kits - Part Nos. 115-107 and 115-116 respectively.
2/ Loosen the tine frame clamp retaining bolts. (see figure 12)
3/ Move the tines to 127mm centres and retighten tine clamping bolts.
4/ Remove the coulter axle nut and remove the 25mm spacer welded to the walking beam. (see figure 13) (Your Agrowdrill dealer can also exchange standard 175mm walking beam assemblies 127mm non-spacer assemblies. There is no charge for this service.)

5/ Loosen the frame clamp retaining bolts on the coulter assemblies (see figure 12) and adjust so the coulter blades align with the soil openers.
6/ Retighten all retaining bolts.
7/ Install the additional down tubes into the blanked off metering mechanisms and remove the blanking-off caps from inside the seed and fertilizer hoppers. (see figure 14)

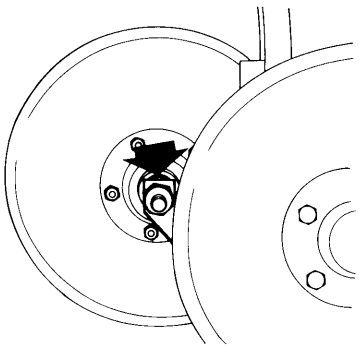


Figure 13

Two Row with multiples of 127mm or 175mm spacings:-

1/ Install a blanking-off cap into the metering mechanism on every second tine. (see figure 14)
2/ If you desire, remove every second tine assembly and down tube.

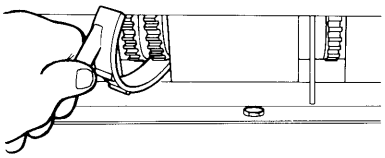


Figure 14

Three Row, infinitely variable spacings:-

In conditions where there is little surface trash or if you use your Agrowdrill as a conventional seeder into previously cultivated soil you may choose to use your Agrowdrill WITHOUT COULTERS. You are not restricted to any set row spacings if you choose to set up your Agrowdrill in this way. You are restricted in that you can only add seeding tines up to the maximum number of outlets available on your machine's metering mechanism. Possible maximum numbers are as follows:-

9 Row	13 Row	18 Row
11	17	24

The procedure for setup is as follows:-
1/ Purchase additional soil openers, tines downtubes and frame clamps if required from your Agrowplow dealer. These are available as a kit.
2/ Remove the coulter assemblies and install soil openers in their place.
3/ Retighten all frame clamping bolts.

4/ HOW SHOULD COULTERS BE SET?

The 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, increased draft and greater surface disturbance. Your Agrowdrill is factory set with standard 175mm spacings and the coulters are adjusted to suit. Use the following procedure if your Agrowdrill requires adjustment:-
1/ Position your Agrowdrill with the tines and coulters resting on a hard surface such as a cement floor.
2/ Observe the coulters and tines, noting any misalignments.
3/ Lift your Agrowdrill and make any necessary adjustments using the procedure outlined in the previous section.
4/ Lower the machine, recheck alignment and retighten clamping bolts.
5/ Check frame clamp bolts **tension after approx. 30 minutes operation.**

6/ If the coulters are not perpendicular to the tool bar they will track off to one side. Ensure all the tynes are square to the frame and retighten the retaining bolts.

Note:- ***Your Agrowdrill is supplied standard with 305mm (12") diameter coulters and shallow offset on the walking beams. See the Maintenance Section (page 21) for coulter replacement procedure and walking beam adjustments.***

Your 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 clayey soils, causing less smearing.
- more aggressive surface disturbance.

5/ WHAT SPEED SHOULD YOU OPERATE?

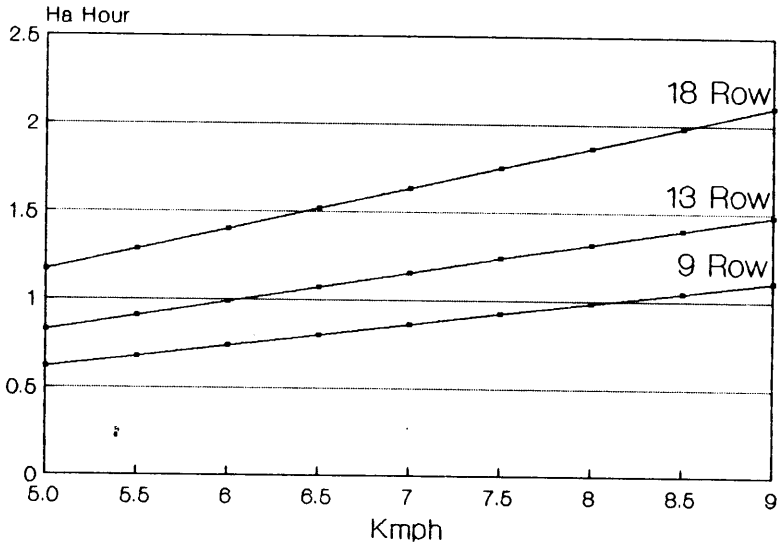


Figure 15

Your Agrowdrill will produce the best results if operated between 4 & 8 kph (3 - 5 mph). Operating at higher speed will cause increased surface disturbance, reduced penetration and seriously reduce the accuracy of seed placement. Higher speed also increases wear on the soil openers.

Figure 15, is a graph of the work rate in Ha/Hour you can expect to achieve with your Agrowdrill.

6/ HOW DO YOU CHANGE THE WHEEL PLACEMENT?

Your Agrowdrill wheel assemblies are interchangeable between side and rear positions. This unique feature allows you to reap the benefits of both mounting position as circumstances demand. The following are some examples:-

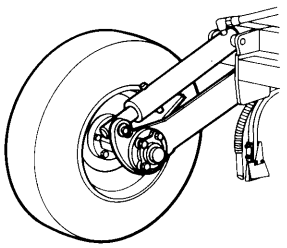


Figure 16

Rear Mounting:-

- allow seeding close to trees or fences.
- reduce side to side "bridging" in some conditions eg. Seeding narrow beds.
- if a narrow transport width is required.
- to transfer weight onto the tractor drawbar on trailing models.
- to allow dual hitching of two Agrowdrills. (see your dealer for details)

Side Mounting:-

- fully support the weight of your Agrowdrill on the wheels.
- reduce "bridging" in most conditions.

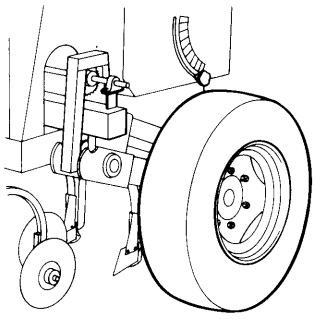


Figure 17

The following is the procedure to change the wheel position:-

1/ Lower your Agrowdrill onto a hard surface so it is supported by the tines.
2/ Remove the frame retaining bolts from the wheel assemblies.
3/ Remove the gearbox drive chain.
4/ Remove the hydraulic cylinders on trailing models. The cylinders can be disconnected easily by removing the pins from each end. DO NOT disconnect the hoses from the cylinders.
5/ Relocate the wheel assemblies and reinstall the retaining bolts using the holes provided in the frame.
6/ Reroute the hydraulic hoses on trailing models and reinstall the cylinders.
7/ Loosen the Allen Key grub screws which retain the drive sprocket on the cross shaft (see figure 18) and slide the drive gear into alignment with the gearbox input sprocket. Retighten the grub screws. (You may need to polish corrosion off the shaft with emery paper to move the sprocket easily)

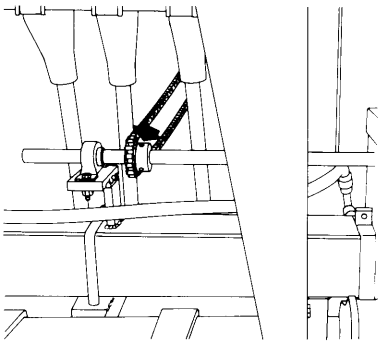


Figure 18

8/ Shorten or lengthen the drive chain using the joining link and short extension length of chain provided.
9/ Reinstall the drive chain.

7 HOW DO YOU ADJUST THE SEED AND FERTILIZER RATES?

Adjusting the seed and fertilizer rates on your Agrowdrill is very simple. Adjustment consists of three components:-

1/ The Varibox Gearbox - Figure 19 & 20
2/ The fluted rollers - Figure 14
3/ The adjustable gate under the fluted rollers - Figure 21

All three may need to be adjusted.

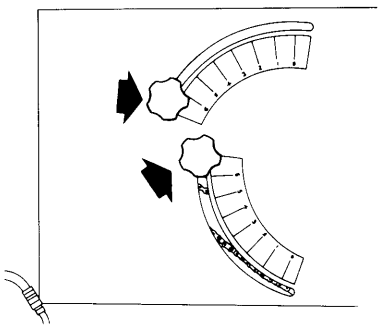


Figure 19 - Maximum Rates

i Gearbox Adjustments:-

Agrowdrills unique gearbox allows adjustment of seed and fertilizer rates over a wide range by simply adjusting one lever for each. The levers are on the left side of your machine. The top lever adjusts the front hopper and the bottom lever adjusts the rear. Use the following procedure to set rates:-

1/ Look up the required seeding and fertilizer rates on the graphs on the following pages.
2/ Loosen each knurled knob (see figure 19 or 20), set the levers to the recommended positions and retighten firmly.

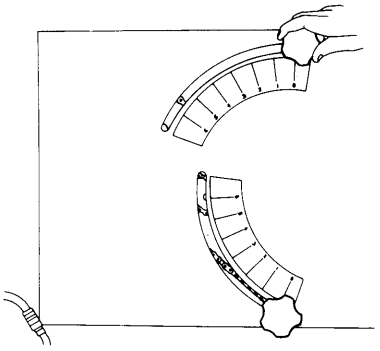


Figure 20 - Minimum Rates

ii Fluted Roller Adjustment:-

The "Fluted" metering rollers (identical for both seed and fertilizer) have a coarse and fine side. (see figure 14) which allows large and small seeds to be accurately metered. This allows your Agrowdrill to handle a wide range of seed sizes with the minimum of adjustment. Check the recommended setting in the calibration charts and use the following procedure to select fine or coarse side:-

1/ Grasp the rear arm of the blanking cap and twist to release it from under the rear ledge. (See figure 14)
2/ Reinsert the cap into the recommended side of the roller.
3/ Repeat the process for all rollers.

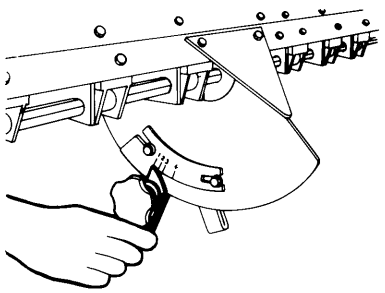


Figure 21

iii 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:-

1/ Check the gate setting recommendation for your seed using the graphs on the following pages.
2/ Loosen the knurled knob (see figure 21), 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.*

8/WHICH HOPPER SHOULD YOU USE FOR SEED?

The metering systems in both hoppers are identical. You can use either for seed or fertilizer as you prefer. We generally recommend that the front hopper be used for fertilizer and the rear 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 fertilizer than seed. The front hopper is a larger capacity and therefore will give you greater efficiency.
- fertilizer is generally denser than seed. Putting the fertilizer in the front hopper will bring your Agrowdrill's centre of gravity forward which is an advantage on three point linkage models.

9/ HOW DO YOU CLEAN THE SEED AND FERTILIZER HOPPERS?

Thorough cleaning of the seed and fertilizer hoppers is very important for a number of reasons.

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

The following is the procedure for cleaning:-

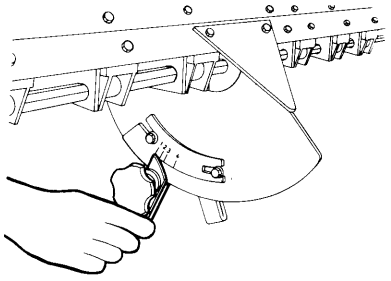


Figure 22

1/ Try to have as little seed or fertilizer as possible remaining after finishing your seeding.
2/ Scrape all the remaining seed and fertilizer to one side and scoop into bags or buckets. Sweep the bottoms of the hoppers clean with a broom.
3/ Remove all blanking off caps (See figure 20) and open the gate under the fluted rollers.(see figure 21)
4/ You can use an air compressor or a water hose to blow or wash out the remaining seed and fertilizer. You may prefer to use a vacuum cleaner and suck out the remaining seed and fertilizer.
5/ Close the gate under the fluted rollers (see figure 22) and reinstall the blanking off caps over the correct side of the fluted rollers (see adjusting seed and fertilizer rates)
6/ Clean any spilled seed or fertilizer which may have accumulated on top of the frame.

Note:-

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

10. SOME OPERATION TIPS

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

i. Incorrect seed or fertilizer rates.

You may find that your seed and fertilizer does not run through at the recommended rate. This is quite normal and is due to differences in grain sizes or treatments used. To avoid seeding or fertilizing at the wrong rate use, the following procedure to "fine tune" your Agrowdrill:-

1/ Fill the hopper to the top and level the seed and fertilizer.
2/ Commence seeding. Work until the hoppers are more than half empty.
3/ Refill the hoppers taking careful note of the amount added.
4/ Note the number of Hectares indicated on the Hectare Meter (if fitted) and calculate the rate using the following formula:-

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

5/ Adjust the rates up or down as necessary.

ii. Calibrating your Agrowdrill for a seed or fertilizer 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 may need to calibrate your Agrowdrill. The following is a quick and accurate method:-

1/ Fill the seed hopper with your seed.
2/ Jack up the left hand wheel and support the frame with solid blocks.
3/ Place a tarpaulin under your Agrowdrill to catch the seed.
4/ Set the metering mechanism to a position you estimate should give the desired seeding rate. (Use the graphs recommendation for a similar sized seed as a guide.)
5/ Rotate the drive wheels as listed below:-

9/11 Run	13/17 Run	18/24 Run
342 Revolutions	**175 Revolutions**	**127 Revolutions**

This is equal to completing 1/10 of a Hectare.
6/ Weigh the seed collected on the tarpaulin.
7/ Use the following formula to calculate the seeding rate:-
Seeding rate (Kg/Ha) = Weight of collected seed x 10
8/ Readjust the setting up or down as necessary and repeat the above procedure until you achieve the desired seeding rate.

iii. 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 page 19 of this manual. The procedure is as follows:-

1/ 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.
2/ Select one of the blank charts on page 19 which best suits the seeding rate you are achieving. These charts have a number of calibrations, allowing for light and heavy seeding rates.
3/ Find the point using the numbers on the <u>BOTTOM LINE</u> of the graph which corresponds with the sowing rate from your Agrowdrill.
4/ Mark a point on the <u>TOP LINE</u> which corresponds to the quadrant setting seven (7).
5/ Draw a straight line from the <u>BOTTOM LEFT HAND CORNER</u> to the point you marked on the top line.

This line indicates the amount of your seed or fertilizer which will be sown a any given Quadrant setting.

iv/ Gradual slowing of fertilizer flow. This often happens when using fertilizers such as Single Super which have a high percentage of fine powder. The powder gradually builds up in the bottom of the fertilizer hopper and slows the flow rate. To avoid this problem, occasionally run the fertilizer 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**

v/ Seizing of the metering system. This can easily happen if you are using fertilizers which are highly soluble and corrosive. eg. Urea. Such fertilizers will "cake" rapidly in moist conditions and may seize the fluted rollers. This can be avoided by never leaving your Agrowdrill filled with fertilizer in moist conditions.

vi/ Checking the rotation of the drives. Before you begin the days seeding you can easily check the rotation of the seed and fertilizer metering systems by "ratcheting" the adjustment levers (see figure 19). 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 fertilizer.
- free small blockages caused by caked fertilizer. 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 fertilizer 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 the paddock.

1/ Ensure both the seed and fertilizer drives are rotating. The Shear Pins in the drive mechanism will shear off if the drives are seized. Problems in this area can be avoided with adequate maintenance and checking the rotation of the drives before commencing. (See above.)
2/ Check that seed and fertilizer are running evenly through all rows.
3/ Ensure that the bottoms of the tubes are not blocking up with wet soil. It this occurs you should allow the soil to dry out further before continuing.
4/ Check the soil openers for loose bolts.
5/ Check the rotation of coulters.
6/ Check the machine for any loose bolts.
7/ Check the alignment of the coulters and openers.
8/ Retension all tyne and coulter clamps.

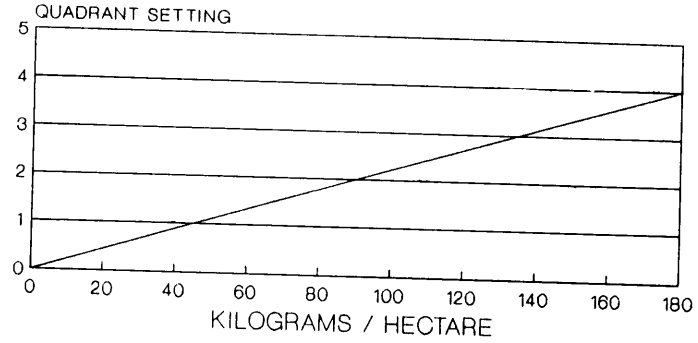
Note:-

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

CALIBRATION CHARTS

-LUPINS-

AGROWDRILL VARIBOX sowing rates.



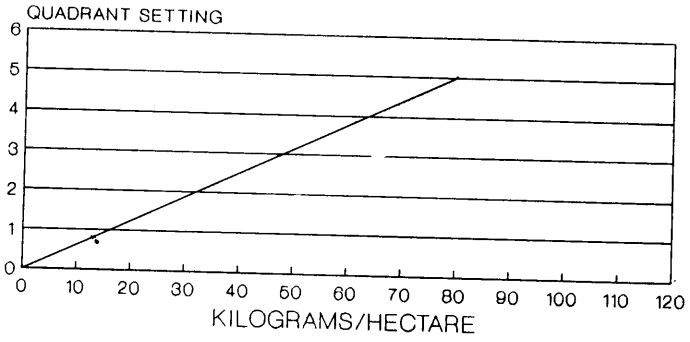
SOWING RATE

— ⊕ 175mm spacing

NO RESTRICTORS / GATE SETTING 3

-OATS-

AGROWDRILL VARIBOX sowing rates.



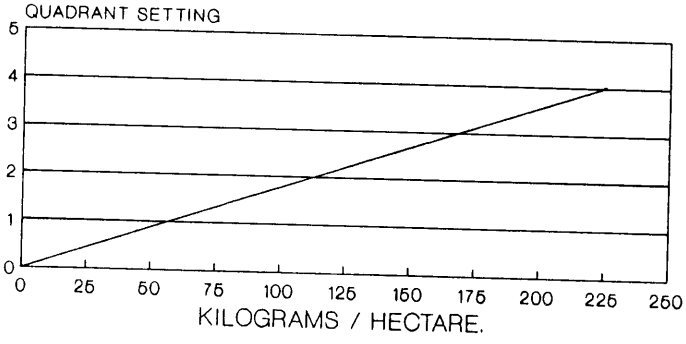
SOWING RATE

— ⊕ 175mm spacing

GATE SETTING 3 / NO RESTRICTORS

-WHEAT-

AGROWDRILL VARIBOX sowing rate.



SOWING RATE

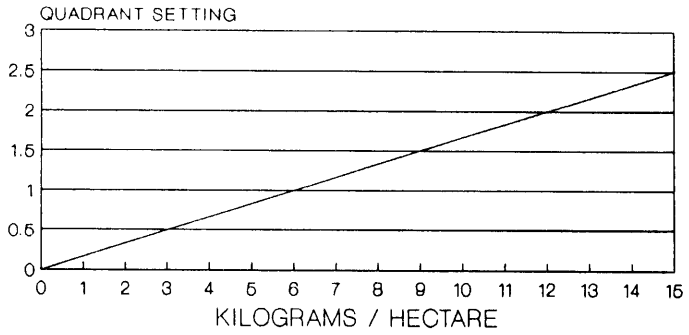
— ⊕ 175 mm spacing

NO RESTRICTORS / GATE SETTING 2

CALIBRATION CHARTS

-SUB CLOVER-

AGROWDRILL VARIBOX sowing rates.



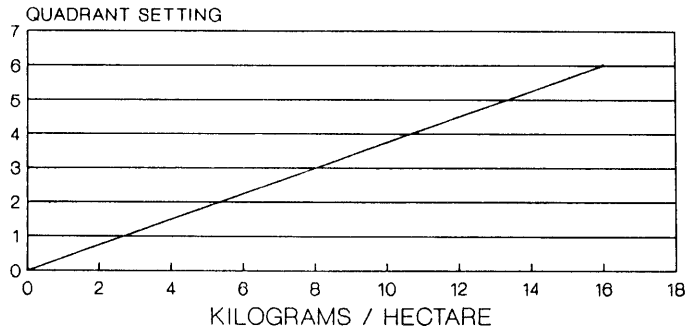
SOWING RATE @ 175mm

— @ 175mm spacing

GATE SETTING 1 / RESTRICTORS FITTED

RYE GRASS

AGROWDRILL VARIBOX sowing rates.



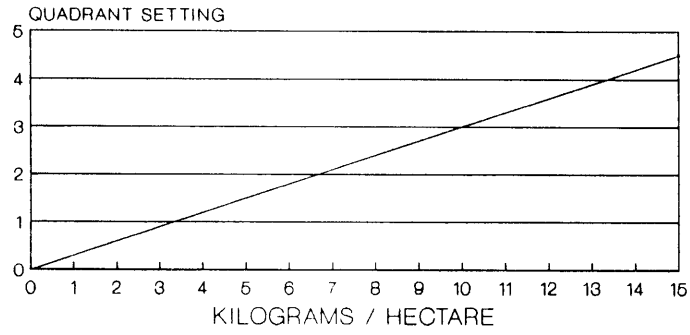
SOWING RATE

— @ 175mm spacing

GATE SETTING 1 / RESTRICTORS FITTED.

-LUCERNE -

AGROWDRILL VARIBOX sowing rates.



sowing rate @ 175mm

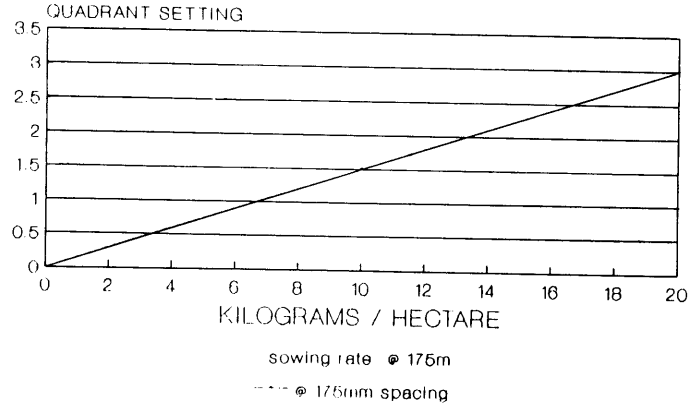
— @ 175mm spacing

GATE SETTING 1 / RESTRICTORS FITTED

CALIBRATION CHARTS

- SORGHUM -

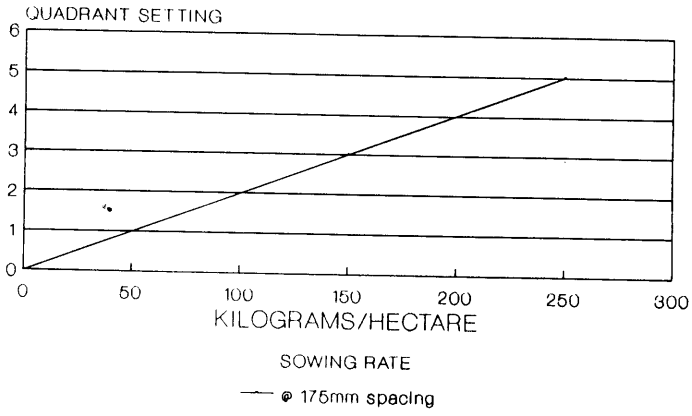
AGROWDRILL VARIBOX sowing rates.



GATE SETTING 1 / RESTRICTORS FITTED.

-SINGLE SUPER-

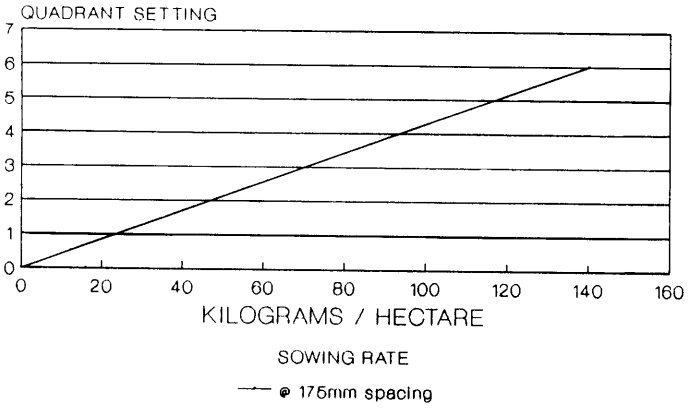
AGROWDRILL VARIBOX sowing rates.



GATE SETTING 2 / NO RESTRICTORS

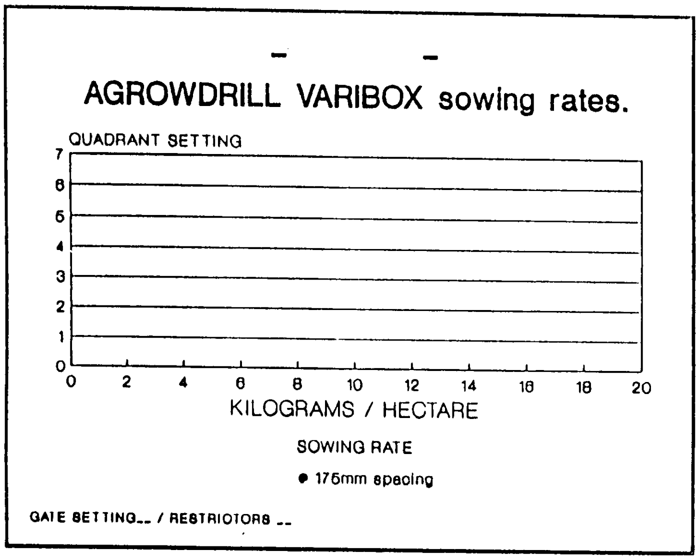
UREA (high analysis)

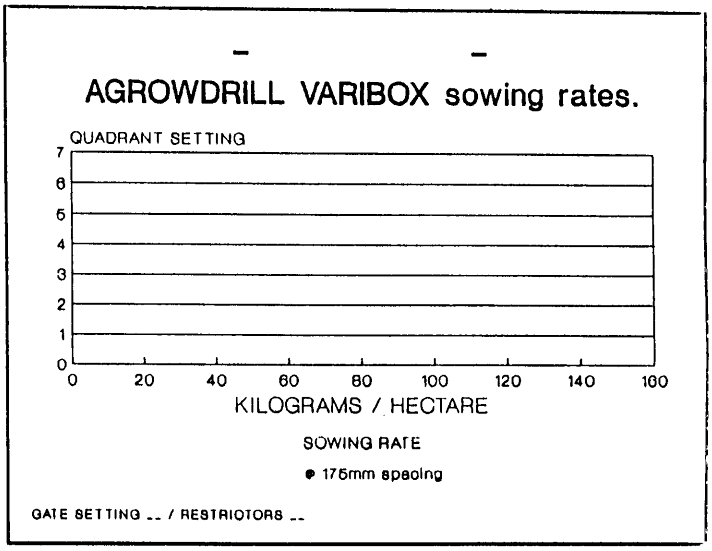
AGROWDRILL VARIBOX sowing rates.

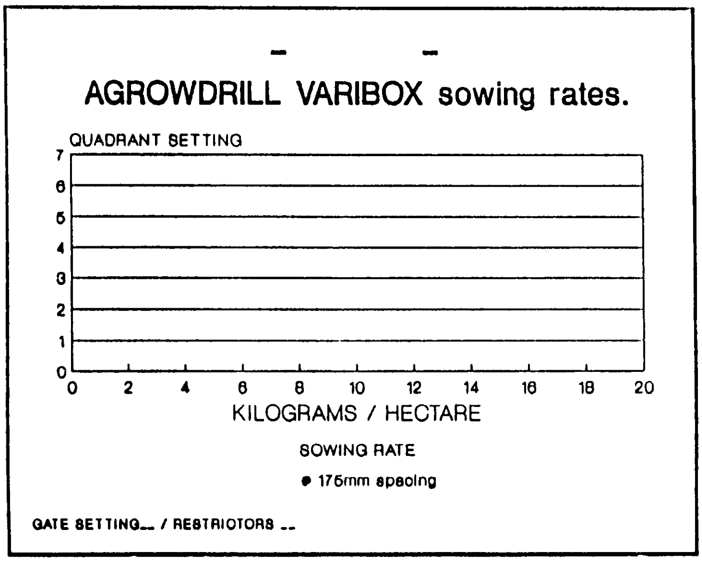


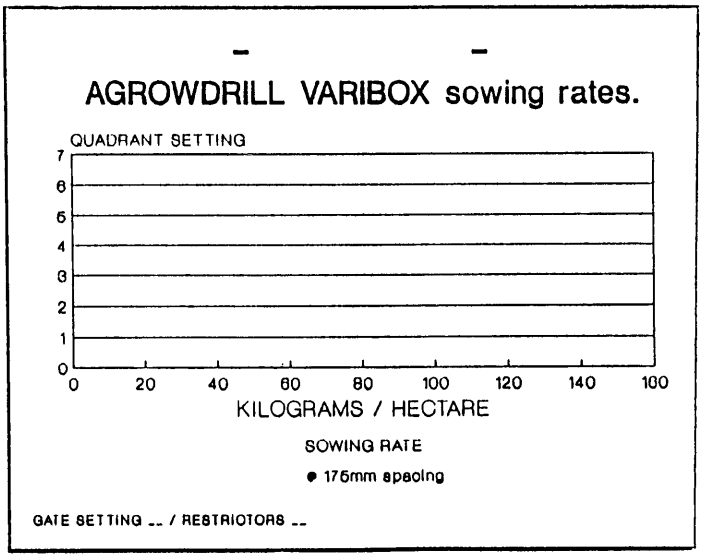
GATE SETTING 1.5 / NO RESTRICTORS FITTED

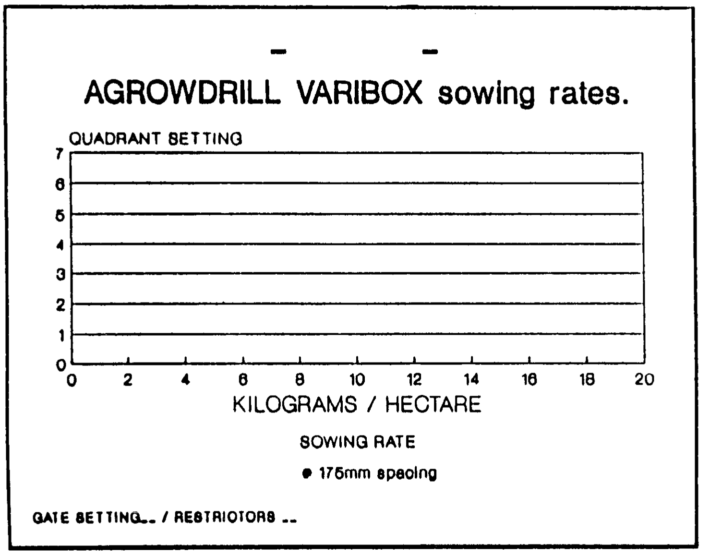
CALIBRATION CHARTS

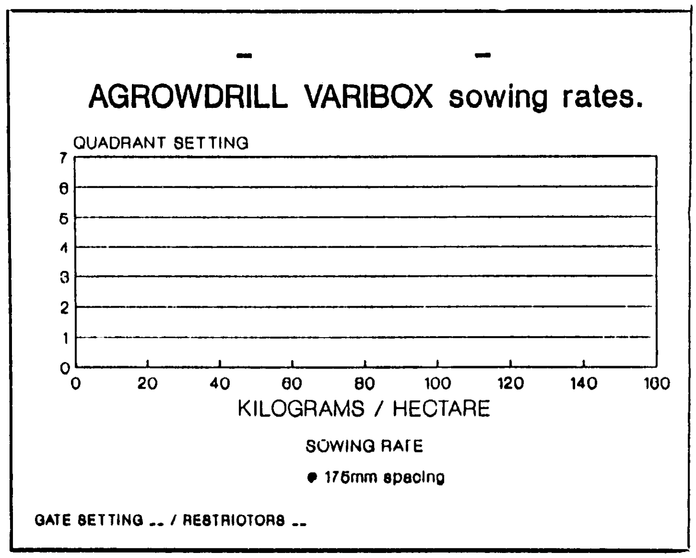












WHAT SHOULD YOU DO TO MAINTAIN YOUR AGROWDRILL?

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

1/ DAILY SERVICE Before starting work each day you should carefully check your Agrowdrill for the following:-

1/ Loose soil opener mounting bolts. Tighten as necessary.
2/ Excessively worn soil openers. Replace as necessary.
3/ 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.
4/ Excessively worn coulters. Replace as necessary. (See page 24)

2/ LUBRICATION Lubrication points intervals are as follows:-

Item	Action	Period
1/ Wheel Axle Bearings	Grease	2 Weeks
2/ Chains	Wash & Grease	200 Hours
3/(a) Varibox	Check oil	200 Hours
3/(b) Varibox	Change Oil	3 Years

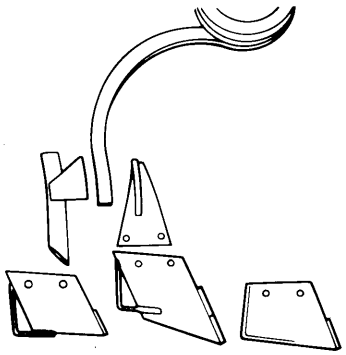


Figure 23

3/ REPLACING SOIL OPENERS Your Agrowdrill is equipped standard 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 will reduce the digging efficiency and accuracy of seed placement of your Agrowdrill.

The procedure for replacing soil openers is as follows:-

1/ Purchase new soil openers from your Agrowplow dealer.
2/ Place your 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.
3/ Remove the two retaining bolts which attach the opener and remove the worn openers. (See figure 24)
4/ Replace any bolts which are worn or damaged and install new openers tightening the bolts firmly.

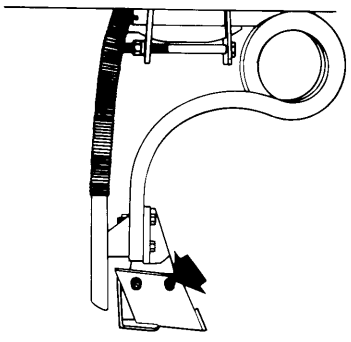


Figure 24

Note:- ***In extremely hard or abrasive conditions you may need to use openers with tungsten tipped heels. See Options Equipment section (page 27) for details of non-standard soil openers available.***

4/ COULTER REPLACEMENT

Coulter replacement procedure is as follows:-

1/ Place your Agrowdrill on a hard surface and lift to the highest position. Support the machine with blocks so that you can safely work underneath.
2/ Remove the 5mm retaining bolts from the coulter bearing housing.(Fig.25)
3/ Remove the worn coulter and replace with a new one of the correct size.
4/ Reinstall the retaining bolts and tighten in sequence. Ensure the coulter is running true by rotating after you have tightened the bolts.

Your Agrowdrill is equipped standard with 305mm (12") coulters. Replacement coulters are available from your Agrowplow dealer in both 305mm (12") and 350mm (14") sizes. Agrowdrill coulters are replaced in sequence. **You will not need to replace all the coulters at once.** Use the following procedure:-

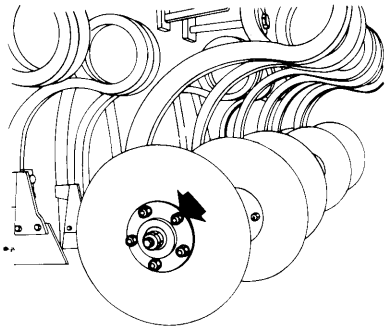


Figure 25

1/ When the front coulter wears to approx. 275mm (11") Install a new 350mm (14") coulter on the rear. **DO NOT discard the worn coulter.**
2/ With the 350mm coulter fitted to the rear of your Agrowdrill will perform efficiently until the front coulter wears down to 225mm (9")
3/ When the front coulter wears down to 225mm replace it with the original coulter you removed from the rear.
4/ When the front coulter wears to 225mm move the rear coulter to the front and install a new 14" coulter on the rear.

Continue the above sequence, **always fitting large new coulters to the rear.** If you break or bend a coulter the new coulter should also be fitted to the rear and the partly worn coulter brought to the front. **Your Agrowdrill will not perform as efficiently with a larger coulter in front.**

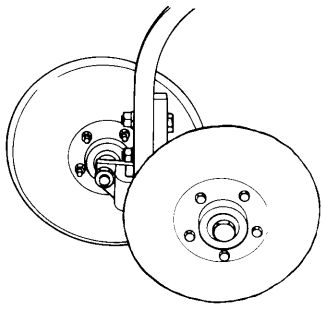


Figure 26

5/ INVERTING THE COULTER WALKING BEAM

The coulter walking beam can be inverted to increase depth by 20mm as the coulter diameter becomes smaller.

1/ Remove a coulter so the walking beam pivot pin can be removed.
2/ Remove the pivot pin and the walking beam, invert and reinstall.

Note:- *Inspect the nylon pivot bush inside the pivot housing and replace if necessary. (Part No 115-406)*

SERVICING DOWNTUBE ASSEMBLIES

Use the following procedure to service downtube assemblies:-

1/ Remove the rubber boot from the retaining lugs on the fluted roller housing. (See figure 27)
2/ Twist the bottom of the flexible tube off the seeding boot and remove the downtube assembly.
3/ Cut the plastic clamp from the rubber boot and screw out the flexible tube.
4/ Replace the rubber boot or flexible tube as required. Ensure that the new flexible tube is of a similar length.

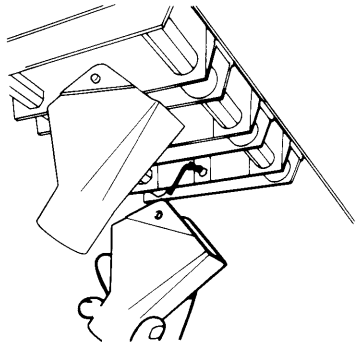


Figure 27

REPLACING THE ADJUSTABLE GATES

The adjustable gates are controlled by a hexagonal rod connected to the adjustment lever. Use the following procedure to replace:-

1/ Remove the drive chain cover plate from the left side.
2/ Loosen the bolt which retains the gate adjusting lever (See figure 21).
3/ Replace the gate as necessary and reverse the above procedure to reassemble.

SERVICING THE FLUTED ROLLERS

The fluted rollers are driven by hexagonal shafts through drive chains and sprockets on the left side of your 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:-

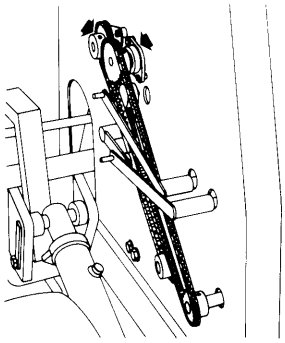


Figure 28

Drive sprocket bearings:-

1/ Remove the drive chain cover.
2/ 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.
3/ Loosen the allen key grub screw retaining the bearing locking collar and rotate the collar to release the bearing.
4/ Remove the two retaining bolts from the bearing housing and slide the bearing off the end of the shaft.
5/ Replace the bearing and reinstall, reversing the above procedure.

Fluted Rollers:-

1/ Remove the drive chain cover and drive chain.
2/ Remove the two mounting bolts from the self aligning ball bearing.
3/ 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 rollers.
4/ Replace the rollers as necessary and reverse the above procedure to reassemble.

(iii) Drive shaft mounting bushes:-

Your 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:-

1/ Remove the fluted roller drive shaft as outlined above.
2/ Remove the retaining bolt from the worn or damaged bush (See Figure 29) and replace the bush.
3/ Reinstall the drive shaft using the reverse of the above procedure.

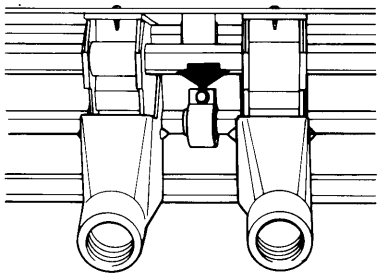


Figure 29

9/ MAJOR SERVICE OF THE METERING MECHANISM

In the event the metering mechanism requiring major service, you can completely remove the bottom of the hoppers. Use the following procedure:-

1/ Remove the down tube assemblies and fluted roller drive sprockets and ball bearing assembly as outlined above.
3/ Remove all blanking off caps.
4/ 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.

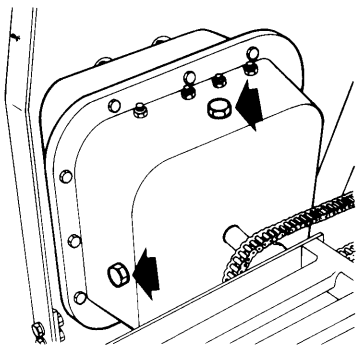


Figure 30

Installation procedure is the reverse of the above. You will need to reseal the ends of the metering assembly (See figure 29) with a quality silicone sealant.

10/ SERVICING THE GEARBOX

The Agrowdrill infinitely variable gearbox requires no maintenance apart from checking the oil level annually. Exchange units are available from your Agrowdrill 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 30.

11/ DRIVE CHAIN ADJUSTMENT

The primary drive chain from the wheel to the cross shaft is fitted with two nylon tensioning pads. The procedure to adjust for chain wear is as follows:-

1/ Loosen one of the tensioning pads, slide along the adjusting slot until the chain has approx. 25mm of play on the drive side.
2/ If insufficient adjustment is available using one pad, loosen the other and repeat the process.
3/ If there is no more adjustment available you may need to replace the drive chain or the adjusting pads.

12/ DRIVE CHAIN MAINTENANCE

The drive chains will benefit from some lubrication. You may choose either of the following:-

- 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.

Note:-

The most crucial measure to ensure long chain life is to avoid leaving the machine exposed to the weather between seeding jobs. Shedding your Agrowdrill will ensure a long and trouble free working life.

OPTIONAL EQUIPMENT.

A number of options are available for your Agrowdrill which increase the versatility of the machine.

(i) Optional soil openers.

Agrowplow can supply a number of optional openers:-

1/ Baker Boot openers with tungsten tips fitted to the digging tip and the heel. (part No 115-412)

These openers should be used in conditions where very high wear rates are a problem. These openers are identical to the standard opener apart from the additional tungsten tips.

2/ Conventional cultivator points. (Part No 115-728)

These can be fitted if you wish to use your Agrowdrill as a conventional cultivator drill. Fitting these requires the use of an adaptor (Part No 115-460) available from your Agrowdrill dealer.

3/ Moisture seeking Baker Boot Openers. (Part No 115-413)

These are an extended Baker Boot Opener which can be used seeding in dry conditions when it is necessary to seed deeper into moisture.

See your Agrowdrill dealer for further details on soil opener options.

(ii) Fourth toolbar.

A fourth toolbar will be available as of January 1991 This will bolt onto the front of your Agrowdrill. Fitting the fourth toolbar allows your Agrowdrill to be used in the following ways:-

1/ **Three soil opener rows plus coulters.**
This may be an advantage in very heavy surface trash conditions.

2/ **Four soil opener rows, no coulters.**
This may be a useful setup for direct drilling where coulters are not required or when using cultivator points.

3/ **Certain specialised seeding jobs such as side banding fertilizer or rowcrop.**

Fitting procedure for the fourth toolbar is as follows:-

1/ Attach the optional toolbar to the front of your Agrowdrill frame using the bolts provided. Ensure all bolts are tightened firmly.

2/ Rearrange the spacings of soil openers and coulters on the front three rows as appropriate for the row spacing you wish to use. (See Setting Up section, pages 10, 11 and 12)

3/ Install tine assemblies onto the fourth bar at your desired row spacings.
4/ Carefully check that the soil openers and coulters are properly aligned.
5/ Retighten all mounting bolts after approx. 30 minutes operation.

(iii) Press wheels.

Your Agrowdrill can be fitted with press wheels for use in conditions where good seed to soil contact may be difficult to achieve. Some of the benefits of press wheels are as follows:-

- firm the soil around the seed to promote good contact with moisture.
- prevent drying of the topsoil.
- improve germination percentages when seeding at a shallow depth.

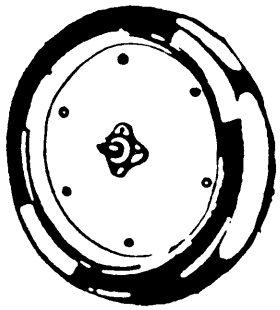


Figure 31

Use the following fitting procedure:-

1/ Attach the press wheel assemblies to the rear toolbar. (See figure 31)
2/ Adjust the press wheels so that they support ALL the weight of the machine at the desired seeding depth.

Note:-

Fitting press wheels or the fourth toolbar assembly drastically increases the weight of the machine. You MUST use additional front tractor weights with three point linkage models to avoid a dangerously unbalanced tractor and implement.

(iv) Converting a linkage machine to trailing or trailing to linkage.

A trailing model Agrowdrill can be easily converted to three point linkage operation by removing the drawbar assembly and attaching directly to the three point linkage hitch points. The remote hydraulics can still be used to set the operating depth.

A linkage Agrowdrill can be converted to a trailing machine by fitting the following:-

1/ The trailing drawbar assembly.
2/ The trailing model hydraulic cylinders, hoses, phasing valve and coupling.

These parts are available from your Agrowplow dealer.

(v) Dual hitching two Agrowdrills

A kit is available from Agrowplow to hitch two machines in tandem giving a greater seeding width for larger farmers. See your Agrowplow dealer for details.

TROUBLE SHOOTING GUIDE.

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

TROUBLE SHOOTING GUIDE.

THE PROBLEM	THE CAUSE	THE CURE
Blocked downtubes or seeding boots.	1/ Mud build up.	1/ Clean out the blockage and wait for dryer conditions.
	2/ Insect or rodent nests.	2/ Remove the downtube and clean. Prevent mice or insects infestations.
	3/ Kinked downtube.	3/ Repair or replace. Avoid conditions where tubes may be damaged.
Coulter "bulldozing" soil.	1/ Coulter worn out.	1/ Replace coulter as outlined in the Maintenance section.
	2/ Seized bearing.	2/ Replace coulter bearing as outlined in the Maintenance section.
Falling fertilizer rate.	Powder build up in the hopper.	See Operating tips (Page 18).
Seed or Fertilizer not running at the correct rate.	Seed or fertilizer different to that used to calibrate the drill.	See Operating tips (Page 18).
One or more rows not delivering seed or fertilizer. (Downtubes and seeding boots not blocked)	1/ Blocked or stripped fluted rollers.	1/ Clean out hoppers, clear any blockages and inspect the fluted rollers. Service as outlined in the Maintenance section.
	2/ Fertilizer clods in hopper.	2/ Clear blockages as above.
One or more rows running seed or fertilizer 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.
Poor lift and steering response with Three Point Linkage models	1/ Your Agrowdrill is TOO HEAVY for your tractor.	1/ Add sufficient front weights. (See your tractor operator's manual) - remove any excess weight from your Agrowdrill. - Move the wheels to the side position.
	2/ Low oil level in your tractor's hydraulics.	2/ Check your hydraulic system and top up if necessary.
Poor lift response with trailing models.	1/ Air in the remote hydraulic hose. 2/ Low oil level in your tractors hydraulics.	1/ Bleed the air from the system. 2/ Check your hydraulic system and top up if necessary.

TROUBLE SHOOTING GUIDE.

THE PROBLEM	THE CAUSE	THE CURE
Self feeding grain and fertilizer	1/ Gate settings too wide. 2/ Blanking Off Caps not in place.	1/ Close up the gate setting. 2/ Check the positioning of the Blanking Off Caps.
Failure of the metering system to deliver seed or fertilizer	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.

SPARE PARTS IDENTIFICATION LIST

The following is a complete list of all the replacement parts available for your 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:-

1/ Find the part and the number in the book.
2/ Ring the dealer spare parts department and quote your machines serial number. (The salesperson needs this so as to be sure he or she is opening the right book.)
3/ Quote the **PAGE number, PART number and the NAME** to the salesperson and ensure that you are both looking at the same diagram and parts list.

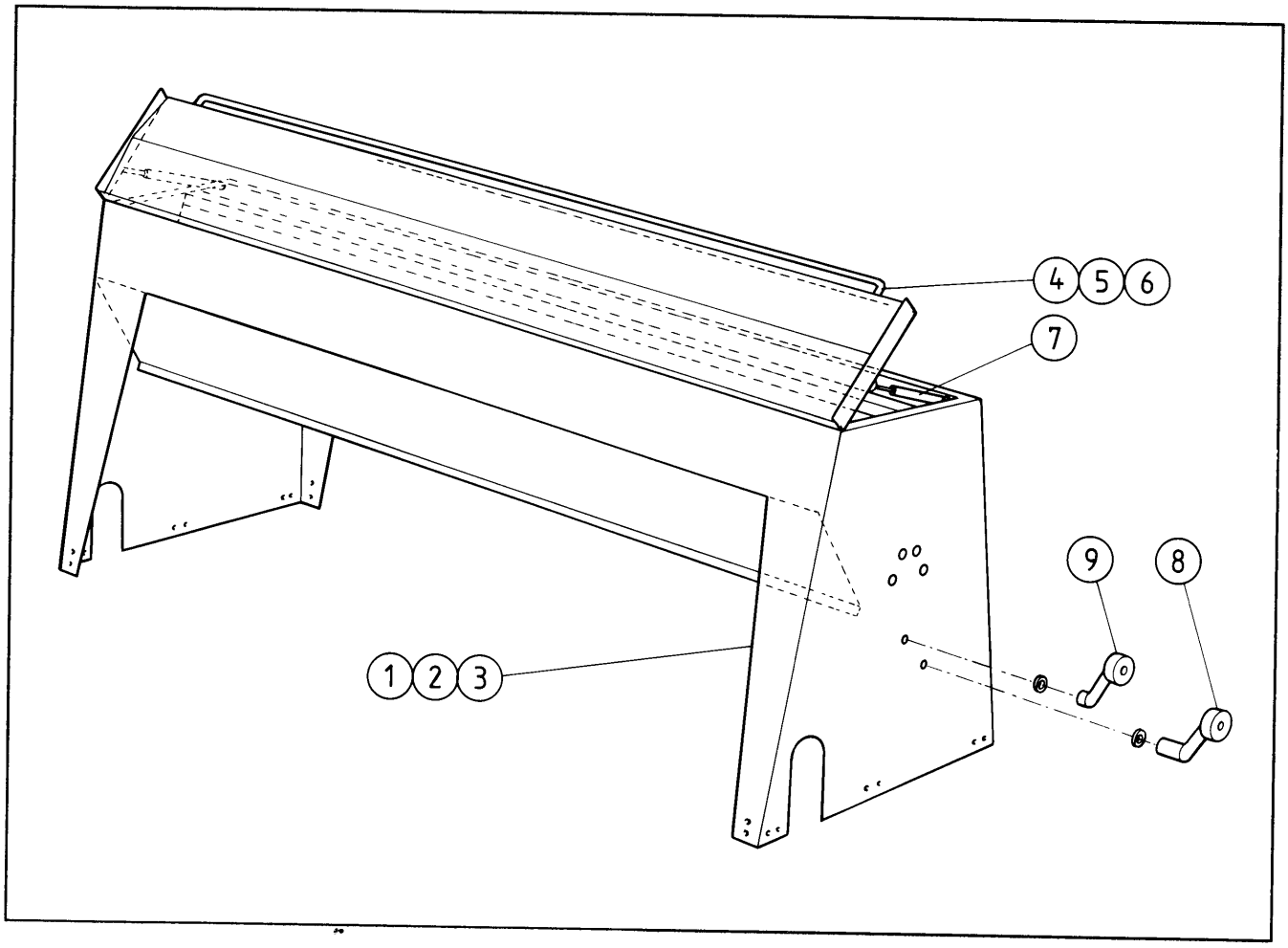
Following the above procedure SHOULD avoid confusion and ensure your satisfaction.

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.

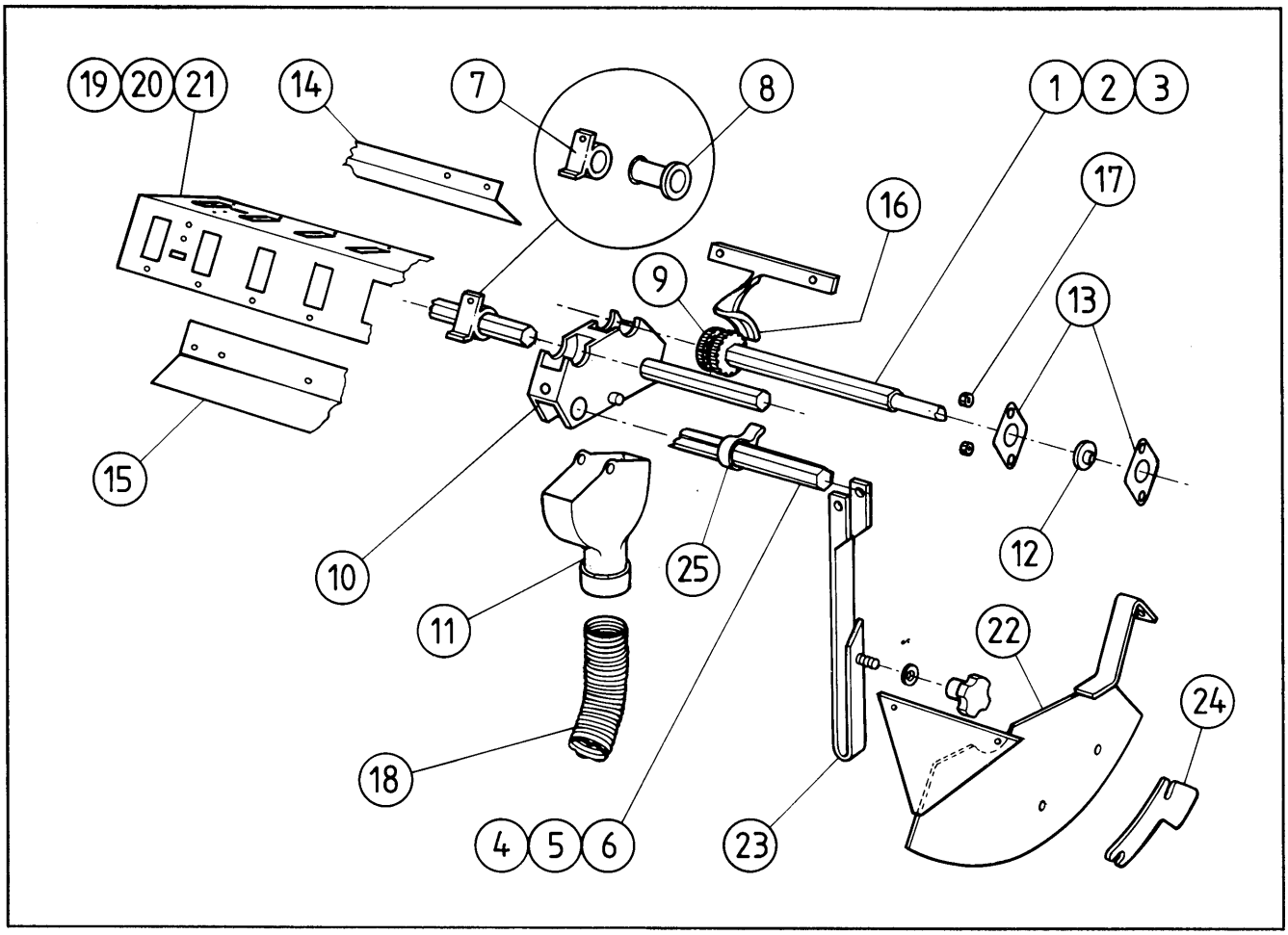
Our policy of continual improvement often results in new improved components replacing existing ones. Your Agrowplow dealer receives regular updates of spare parts information and will make every effort to ensure you are promptly supplied with the correct components. We suggest you write in any changes to components and part numbers for your Agrowdrill at the bottom of the lists on the following pages.

SEED & FERTILIZER BOX ASSEMBLIES



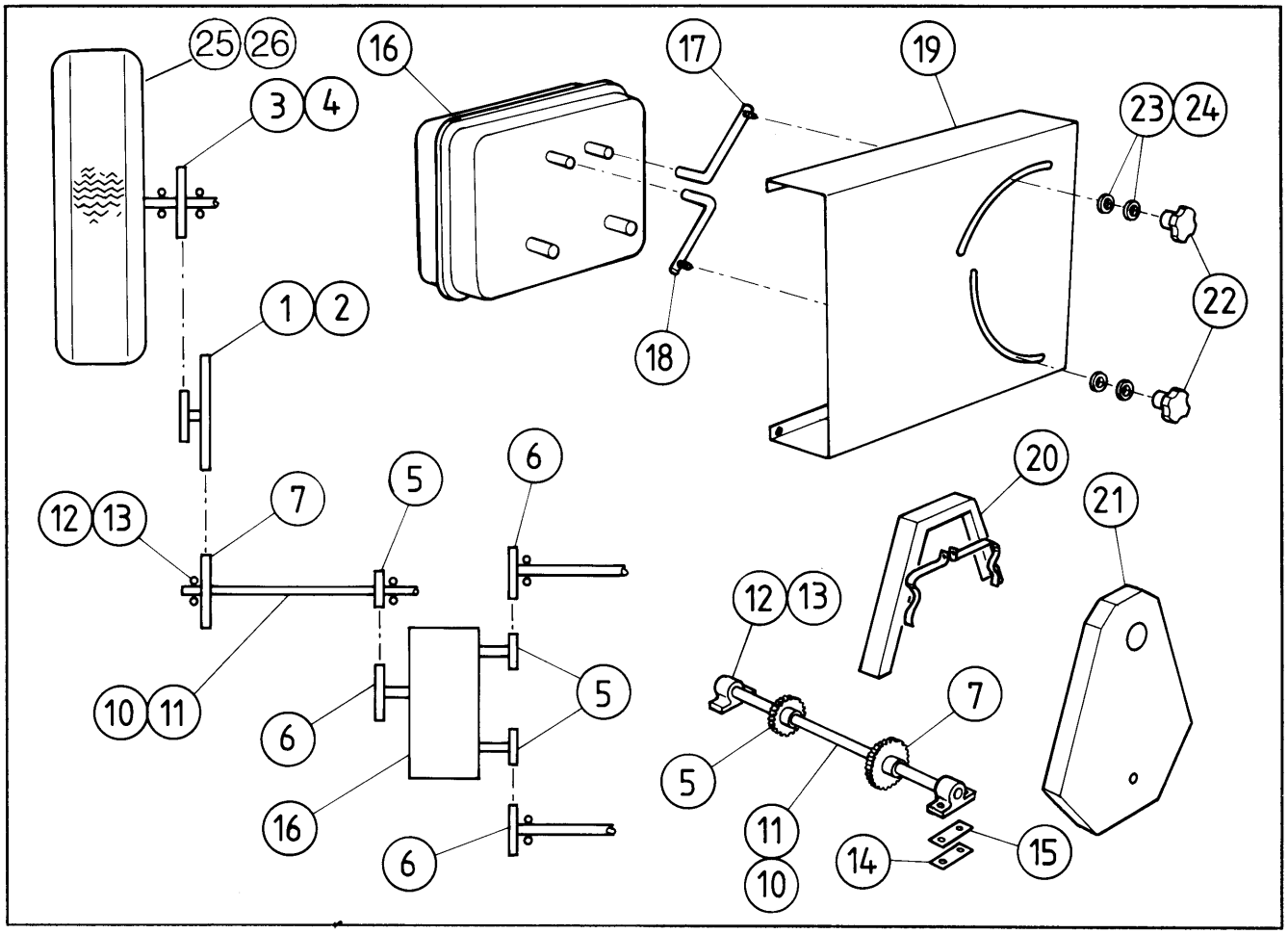
Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Hopper - 18 Run	117-103			1
2	Hopper - 13 Run	116-113		1	
3	Hopper - 9 Run	115-103	1		
4	Lid - 9 Run	115-102	1		
5	Lid - 13 Run	116-105		1	
6	Lid - 18 Run	117-102			1
7	Gas Strut	115-701	2	2	2
8	Chain Tensioner (R.H.)	115-210	1	1	1
9	Chain Tensioner (L.H.)	115-211	1	1	1

METERING MECHANISM



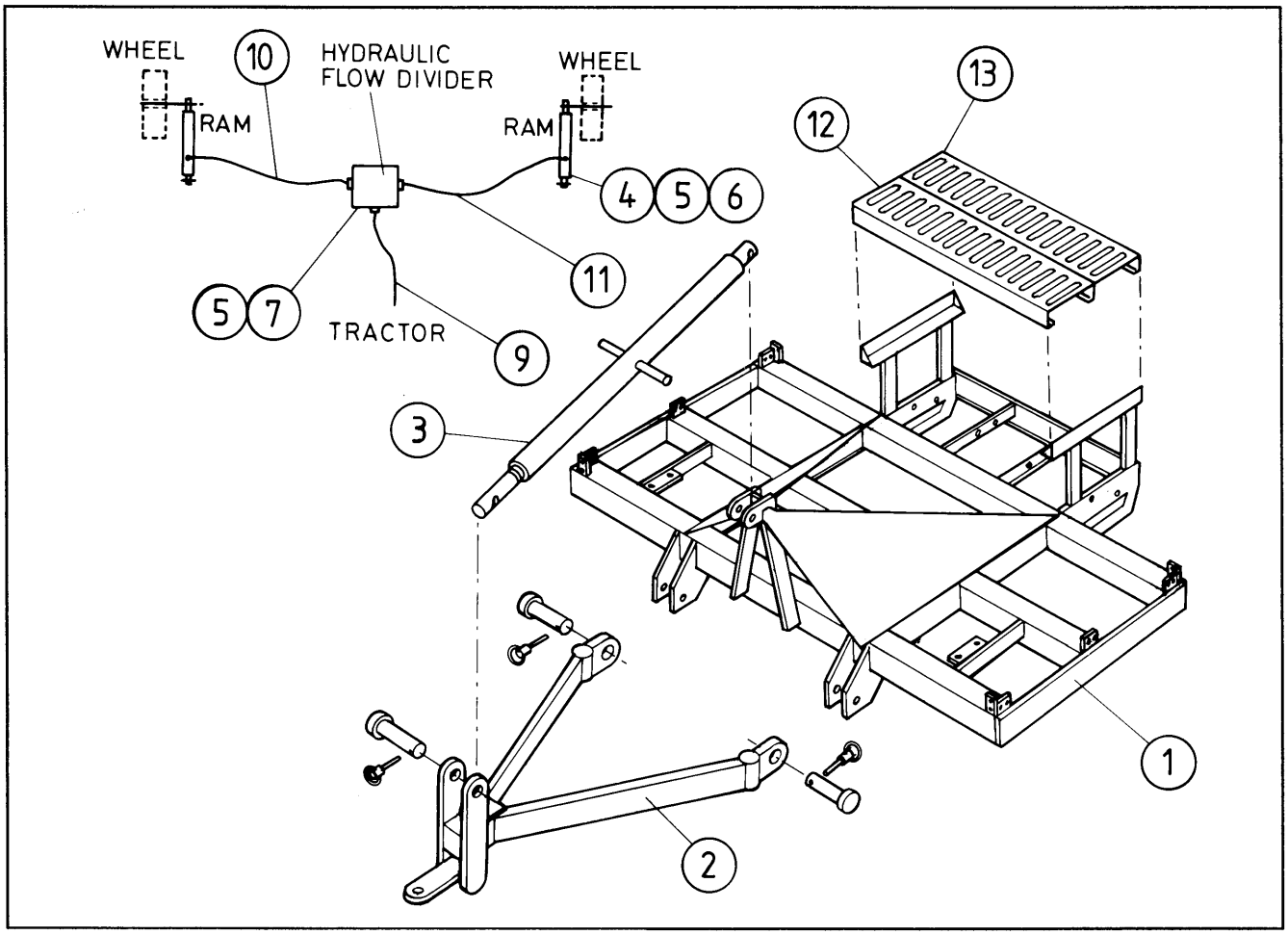
Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Hex Roller Shaft - 9 Run	115-419a	2		
2	Hex Roller Shaft - 13 Run	115-419b		2	
3	Hex Roller Shaft - 18 Run	115-419c			2
4	Gate Hex Shaft - 9 Run	115-470a	2		
5	Gate Hex Shaft - 13 Run	115-470b		2	
6	Gate Hex Shaft - 18 Run	115-470c			2
7	Roller shaft Bearing Housing	115-407	8	12	16
8	Bearing Insert	115-722	8	12	16
9	Seed Roller	115-301	22	34	48
10	Roller & Gate Housing	115-202	11	17	24
11	Feed Cup	115-112	11	17	24
12	Bearing UB204	115-706	2	2	2
13	Bearing Housing PFL204	115-707	4	4	4
14	Verandah - Seed	115-429	1	1	1
15	Verandah - Fertilizer	115-430	1	1	1
16	Blanking Off Cap	115-401	17	29	42
17	Bearing Bolt Spacer	115-422	4	4	4
18	Hose - Barflow 31.5mm (Black)	400-008	9	13	18
19	Valley Sheet - 9 Run	115-200	1		
20	Valley Sheet - 13 Run	116-200		1	
21	Valley Sheet - 18 Run	117-200			1
22	Gate Adjustment Quadrant	115-109	2	2	2
23	Gate Adjustment Levers	115-321	2	2	2
24	Gate Adjustment Slide	115-449	2	2	2
25	Seed or Fertilizer Gate	115-414	22	34	48

DRIVE TRAIN, VARIBOX & GUARDS



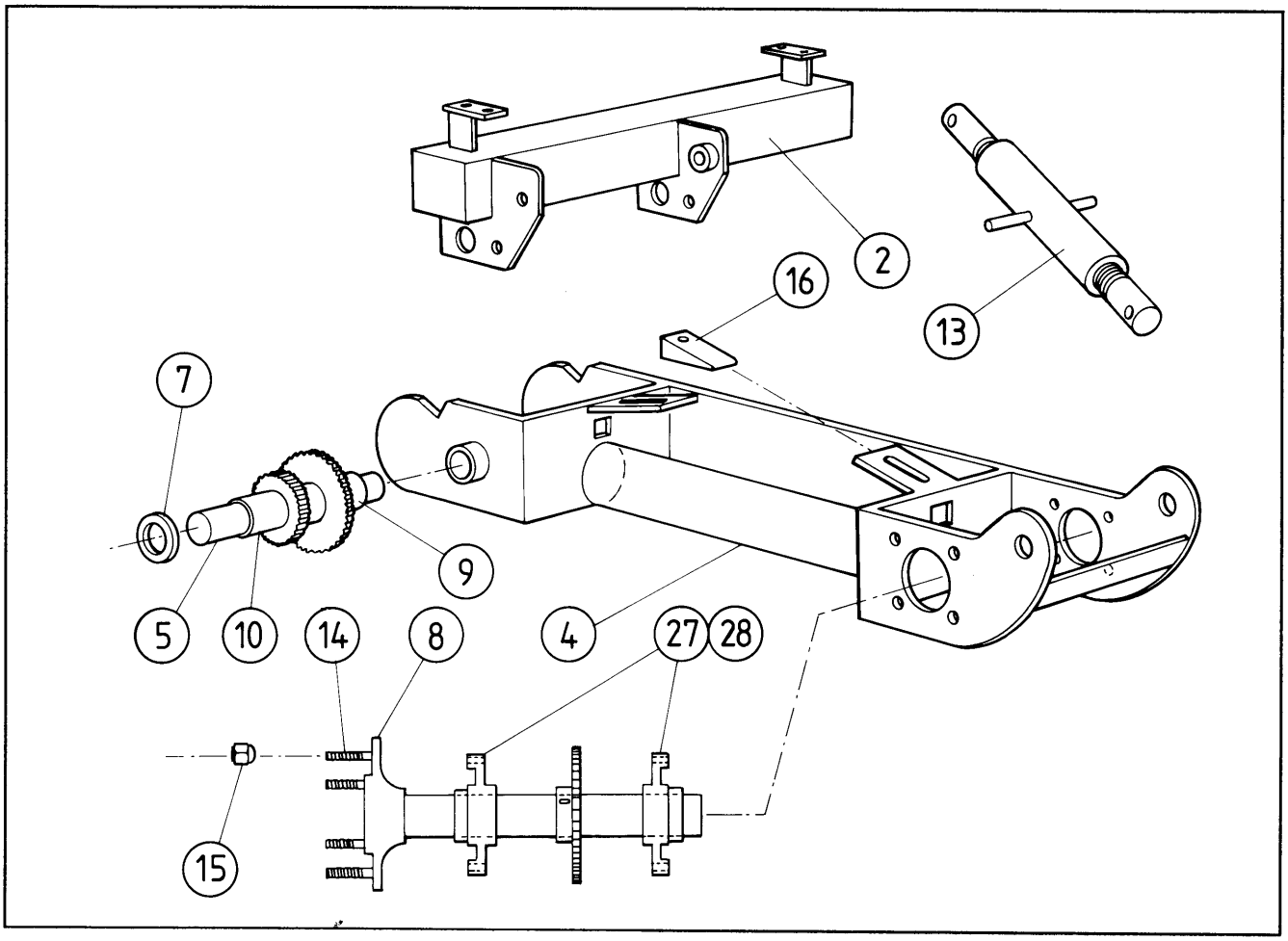
Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Drive Sprocket	116-310		1	1
2	Drive Sprocket	115-330	1		
3	Sprocket 30T,9R Wheel arm	115-438	1		
4	Sprocket 30T,13 & 18R Wheel arm	117-409		1	1
5	Sprocket 14T	115-421b	3	3	3
6	Sprocket 21T	115-420b	3	3	3
7	Sprocket 30T	115-425f	1	1	1
8	Grub Screw M8 x 16mm	115-713		3	3
9	Grub Screw M8 x 12mm	115-730	14	14	14
10	Idle Shaft	115-456	1		
11	Idle Shaft	116-403		1	1
12	Bearing UB240	115-706	2	2	2
13	Bearing Housing PP204	115-705	2	2	2
14	Shim Spacer 1.6mm	115-440	2	2	2
15	Shim Spacer 3.0mm	115-441	2	2	2
16	Varibox	115-110	1	1	1
17	Varibox Adjusting Lever (R.H)	115-323	1	1	1
18	Varibox Adjusting Lever (L.H)	115-322	1	1	1
19	Varibox Quadrant Guard	115-117	1	1	1
20	Vertical Chain Guard (13 & 18R)	116-107		1	1
21	Vertical Chain Guard (9R)	115-121	1		
22	Handwheel	115-714	2	2	2
23	Washer 1/2" Flat	135-060	2	2	2
24	Washer 1/2" Nylon	135-200	2	2	2
25	Wheel 7.50 x 16	162-003		2	2
26	Wheel 6.15 x 13	162-002	2		

FRAME ASSEMBLIES & HYDRAULICS



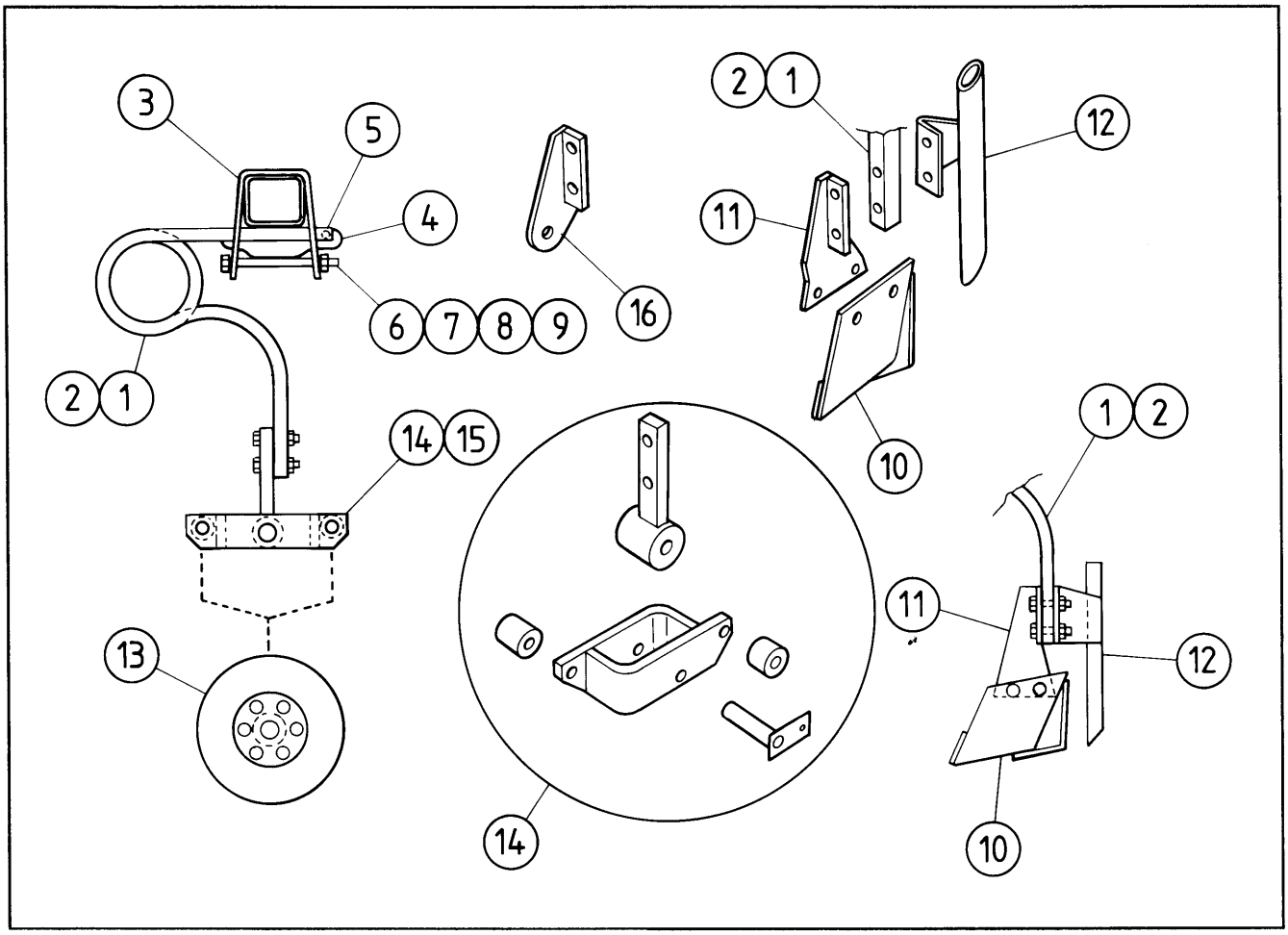
Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	9 Run Drill Frame	115-101	1		
1	13 Run Drill Frame	116-101		1	
1	18 Run Drill Frame	117-101			1
2	"A" Frame (13 Run)	116-103		1	
2	"A" Frame (18 Run)	117-110			1
3	Levelling Tube	115-241		1	1
4	Ram Assembly (complete)	153-338		2	2
5	Nipple	154-005		5	5
6	Depth Adjustor	116-112		2	2
7	Flow Divider Valve	115-703		1	1
8	Hydraulic Hose (Front)	116-420		1	1
9	Hydraulic Hose (R.H.)	116-422		1	1
10	Hydraulic Hose (L.H.)	116-421		1	1
11	Hydraulic Conversion Kit (Assy.)	116-117	na	1	1
12	Platfrom - Male (9 Run)	115-790m	1		
13	Platform - Female (9 Run)	115-790f	1		
12	Platform - Male (13 Run)	116-790m		1	
13	Platform - Female (13 Run)	116-790f		1	
12	Platform - Male (18 Run)	117-790m			1
13	Platform - Female (18 Run)	117-790f			1

WHEEL ASSEMBLIES - 9, 13 AND 18 ROW



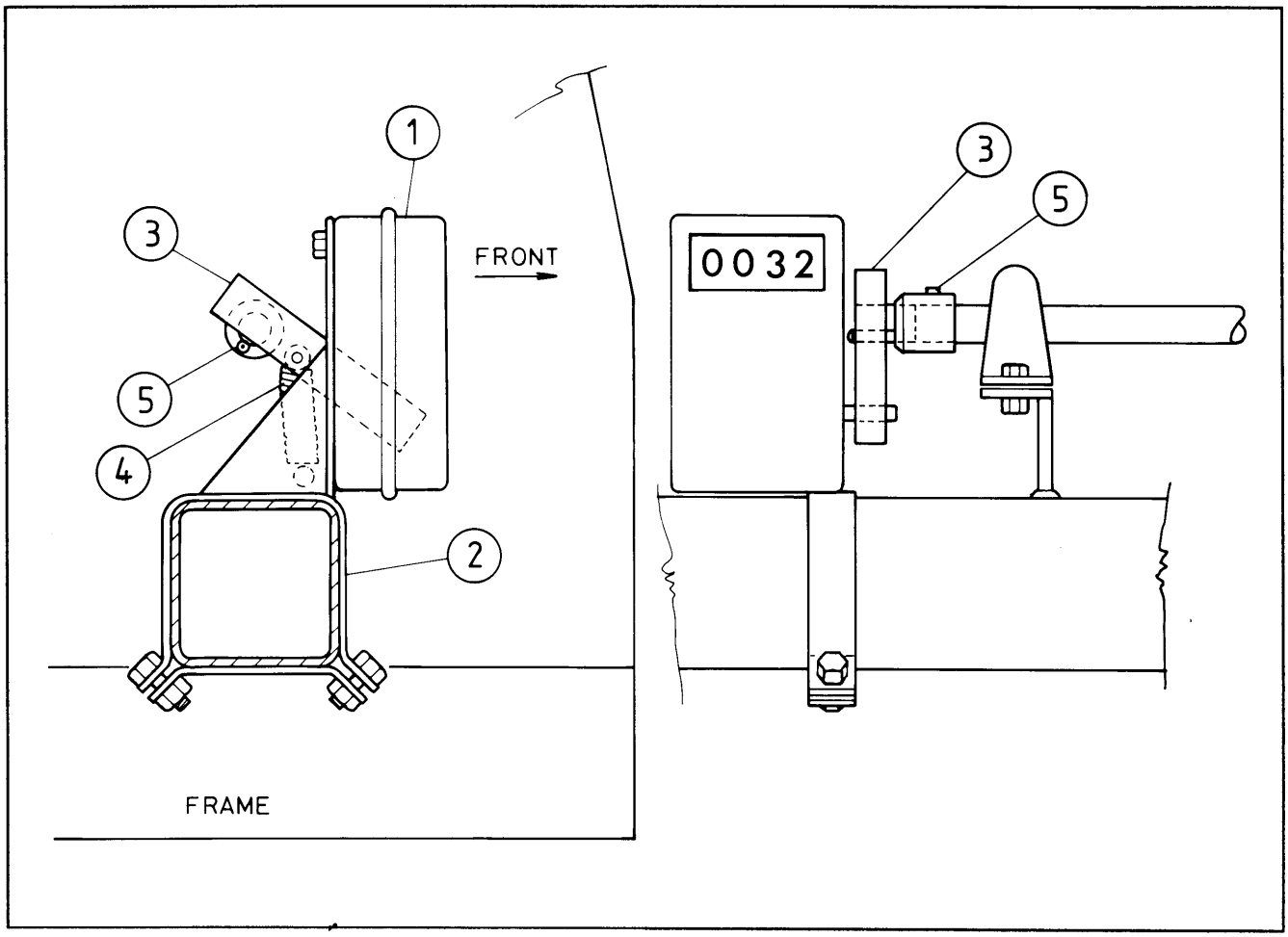
Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Wheel Arm Carrier (R.H.)	117-112		1	1
2	Wheel Arm Carrier (L.H.)	117-113		1	1
3	Wheel Arm (R.H.)	117-104		1	1
4	Wheel Arm (L.H.)	117-105		1	1
5	Pivot Pin	117-306		2	2
6	Circlip 50mm	115-721		4	4
7	Circlip Spacer	117-414		2	2
8	Axle Hub	117-205		2	2
9	Drive Sprocket Spacer 13mm	117-410		1	1
10	Drive Sprocket Spacer 30mm	117-411		1	1
11	Spacer - 5/8"	117-701		4	4
12	Wheel - 8w x 16"	162-003		2	2
13	Depth Adjustor (3 Point Linkage)	116-104		2	2
14	Wheel Stud	115-715		12	12
15	Wheel Nut	115-716		12	12
16	Tension Wedge	117-406		2	2
17	Wheel Arm Carrier (R.H.)	115-205	1		
18	Wheel Arm Carrier (L.H.)	115-115	1		
19	Wheel Arm (R.H.)	115-127	1		
20	Wheel Arm (L.H.)	115-128	1		
21	Clamp Plate	011-301	2		
22	Circlip - 38mm	136-004	2		
23	Circlip Spacer	115-455	2		
24	Grease Nipple	166-001	2		
25	Turnbuckle B312	115-727	2		
26	Wheel - 13"	162-002	2		
27	Bearing UC210	115-704		4	4
28	Housing FC210J	138-052		4	4

TINE & COULTER ASSEMBLIES & FRAME CLAMP ASSEMBLY



Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Tine (R.H.)	115-118	6	9	15
2	Tine (L.H.)	115-119	8	11	12
3	Clamp	115-309	14	20	27
4	Wedge	115-310 -	14	20	27
5	Split Pin	115-718	14	20	27
6	Bolt - 5/8" UNC x 8"	133-340	14	20	27
7	Nut - 5/8" UNC	134-090	14	20	27
8	Washer - 5/8" Spring	135-070	14	20	27
9	Washer - 5/8" Flat	135-080	14	20	27
10	Seed Boot	115-411	9	13	18
11	Seed Boot Carrier	115-409	9	13	18
12	Seed Outlet Tube	115-306	9	13	18
13	Coulter Disc - 12" (305mm)	190-205	9	13	18
14	Double Coulter Bracket (R.H.)	115-307	2	3	9
15	Double Coulter Bracket (L.H.)	115-308	2	3	
16	Single Coulter Bracket	115-428	1	1	
17	Cultivator Adaptor	115-460	9	13	18
18	Cultivator Point	115-728	9	13	18
19	Extended Baker Boot	115-331	9	13	18

HECTARE COUNTER - OPTIONAL



Item No	Description	Part Number	No.Required 9 row	No.Required 13 Row	No.Required 18 Row
1	Hectare Meter	115-750	1	1	1
2	Ha Meter Carrier (9 Run)	115-126	1	1	1
2	Ha Meter Carrier (13 & 18 Run)	116-111		1	1
3	Pitman Lever	115-462	1	1	1
4	Spring	115-751	1	1	1
5	Cam Assembly	115-464	1	1	1

AGROWPLOW®

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