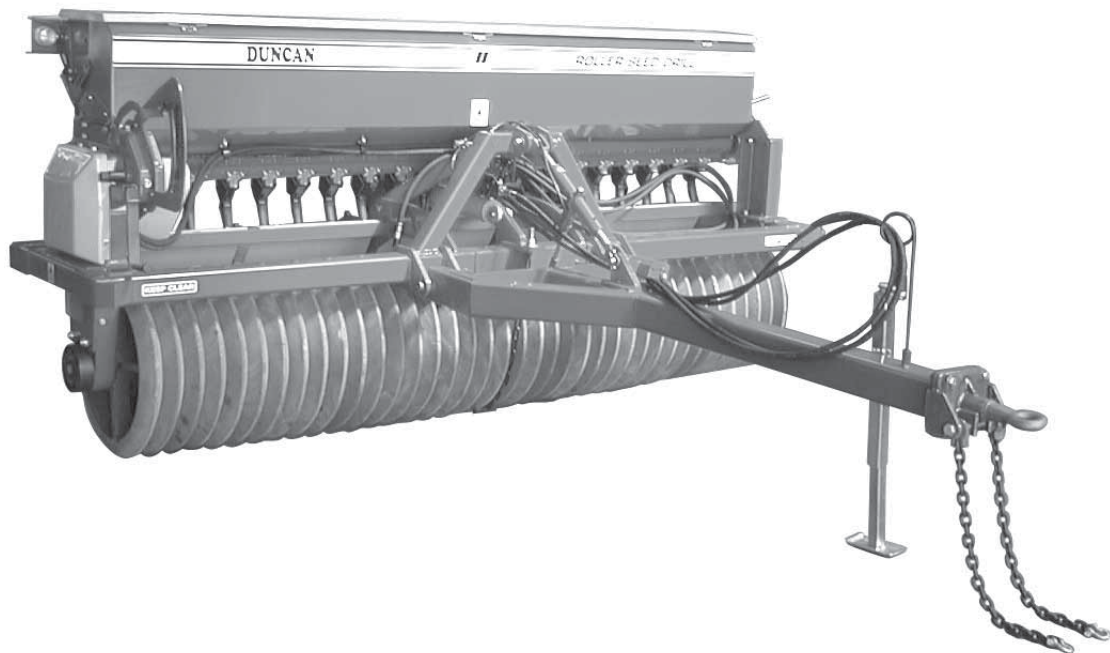


Owners Manual



Roller Seed Drill

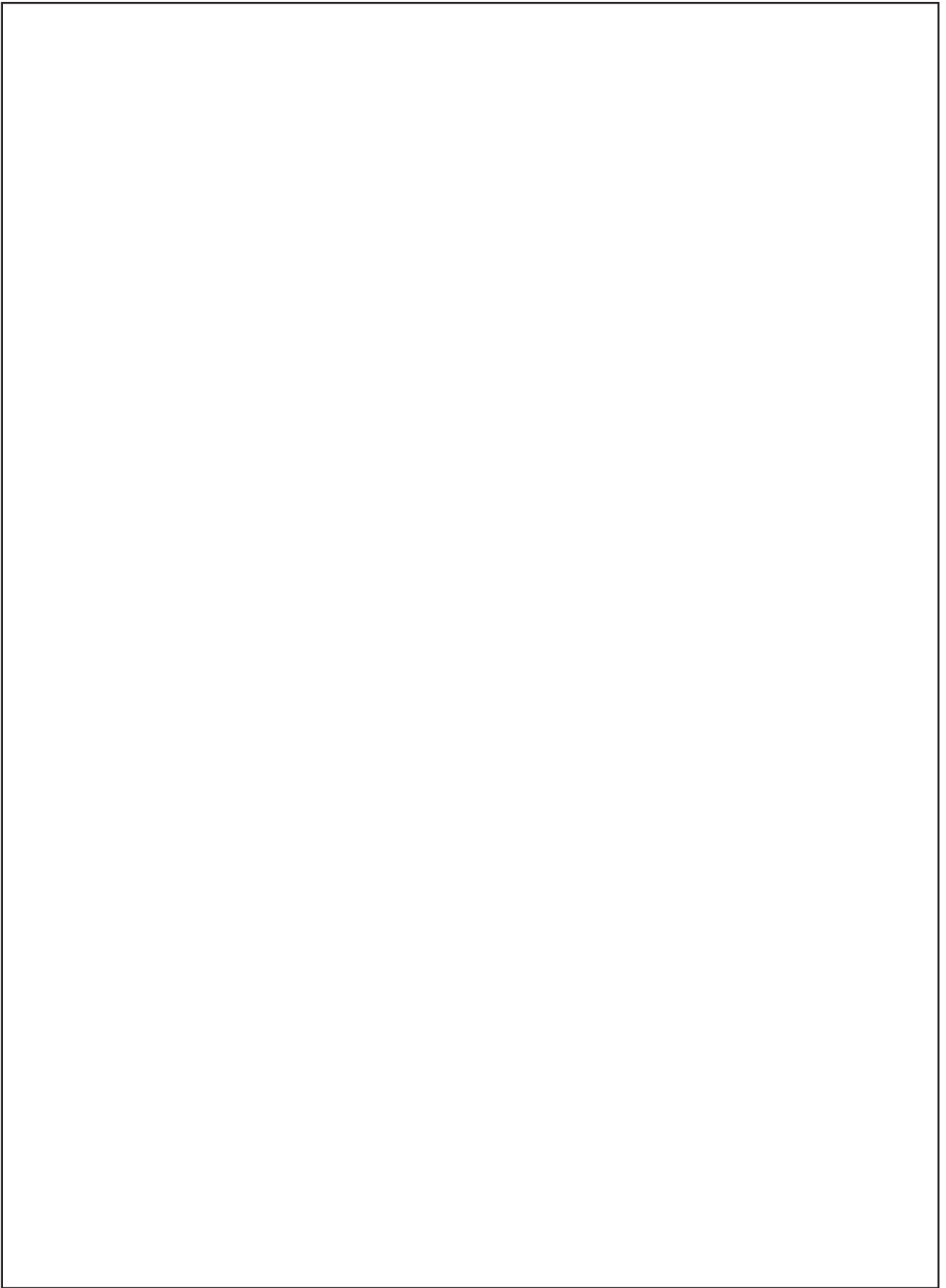


Built to work.

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Introduction

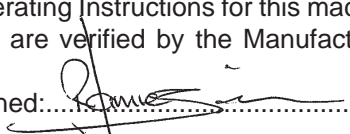
Acquisition & Warranty

On delivery of your new Duncan Roller Drill please check that the machine is not damaged. In cases of shipping damage, please ask your dealer to arrange for the appropriate claim to be lodged immediately. Assemble any parts supplied loose and inspect your machine with the aid of this manual to familiarise yourself with its features. If you have any queries ask your dealer straight away. The machine is covered by our 12 month warranty on faulty parts, subject to normal use.



Record below the serial number of your machine and keep it in a secure place to help trace the machine and assist us when you order parts.

Model:
Serial No:
Owner:
.....
.....
Delivery Date:
Dealer:
.....
.....

This Document contains the Original Operating Instructions for this machine and are verified by the Manufacturer, Signed:.....  Product Development Manager

The Owner's Manual

Your new Duncan Roller Drill will give long and efficient service if given normal care and operated properly.

This owner's manual is provided so that you can become thoroughly familiar with the design of the machine and to furnish information on correct operation, adjustment and maintenance. **Only persons well acquainted with these guidelines should be allowed to use the equipment.**

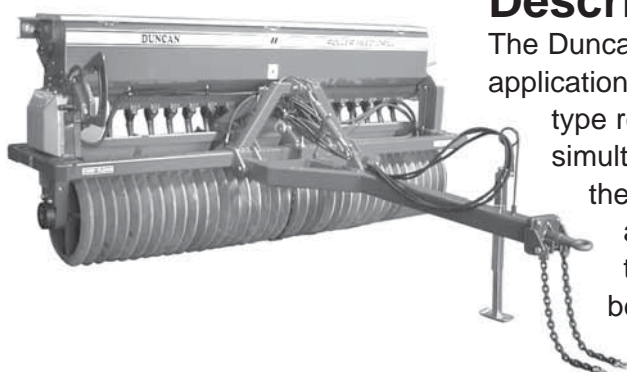
A separate illustrated parts section has been provided so that if any parts are required your dealer will be able to supply them by reference to part numbers.

The manual is considered as part of your machine and must remain with the machine when it is sold.

Right and left hand references in this manual are determined by standing behind the machine and facing in the direction of travel.

Disclaimer Every effort has been made to ensure that the information in this manual was accurate and up to date at the time of going to press. Clough Agriculture reserves the right to make subsequent changes to the machine, where necessary, without notification. The Company will not be responsible for any damage or consequential loss arising out of misinterpretation or failure to follow recommended procedures. Nor will it be liable for any damage caused by or arising out of modification or misuse of its product. The owner has a responsibility to protect himself and others by observing all safety information and by ensuring all operators are well acquainted with the safety information, trained in the correct use of the machine and applying safe work practices.
--

Description of Machine



The Duncan Roller Drill has been developed for applications where the combination of a Cambridge type roller and seed sowing can be carried out simultaneously. The machine comes with or without the transport wheels. All machines consist of a robust heavy section RHS frame attached to the roller by heavy duty shock mounted bearings.

Attached to the frame is our standard type seedbox featuring a quality European type pegged roller system handling all seeds from turnip and rape to peas and maize. The seeder drive is via an hydraulically operated clutch and variable speed gear box driven from the roller axle.

Working Principle

The gearbox, pegged seed rollers and seeder flaps are set to give the desired seed rate.

Seed flows down the seed chutes and is broadcast onto the prepared seed bed. The roller drill is normally followed by a second plain roller, trailing harrows or a combination of both.

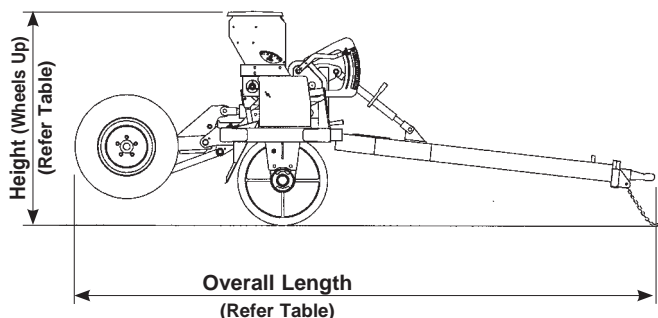
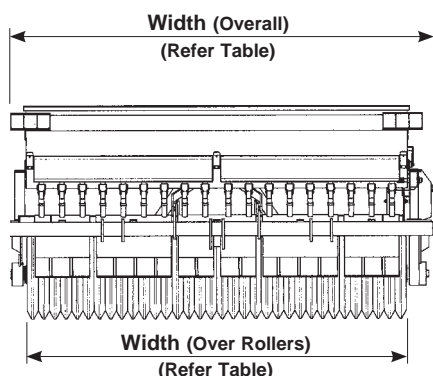
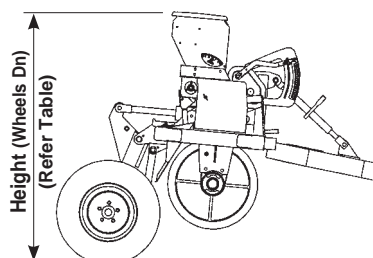


fig 2



Dimensions & Capacities

	8' Drill	9' Drill	10' Drill
Width (Overall)	2800	3125	3455
Width (Over Rollers)	2455	2780	3105
Overall Length (min-max)	3780 - 4170	3780 - 4170	3780 - 4170
Height (Wheels Up)	1740	1740	1740
Height (Wheels Down)	2010	2010	2010
Weight (Unladen)	2080kg	2260kg	2440kg
Tyre Size	10.0/75 - 15.3 AW 702		
Maximum Speed *	30kph	30kph	30kph
Max Tyre Pressure	3.1-4.2 bar 45-60 psi	3.1-4.2 bar 45-60 psi	3.1-4.2 bar 45-60 psi
Sowing Width	2.370m	2.670m	2.970m
Box Capacity (litres)	393 litres	441 litres	488 litres

* Maximum speed applies when wheels are fitted



ATTENTION

On the machine important safety information is indicated by these symbols. These highlight general safety aspects in regard to the machine rather than specific hazards.



NO RIDE

Do not ride or allow passengers on the machine.

Under no circumstances are passengers to be permitted on the machine while it is in operation or being transported. Any footboards and/or footsteps are provided solely for the purpose of preparing the machine for use.



**Pinch Points
Moving Parts**

Keep clothing and body extremities well clear of pinch points while the machine is operating (seeding or calibrating). Keep well clear of moving parts at all times.

These signs typically occur wherever trapping points exist. These include drive chains, sprockets, shafts, wheels, discs, pivot points, etc. Guards are provided with the machine for safety reasons (where practical without compromising machine performance). Ensure these are always fitted during operation.



**Sharp
Points**

Always exercise extreme caution in the vicinity of sharp edges and points.

Where possible guards are provided with the machine for safety reasons (where practical without compromising machine performance). Ensure these are always fitted during operation.



**Slippery
When
Wet**

Footboards, footsteps, drawbars and other machine surfaces may be slippery when wet.

Apply extra caution in wet conditions and in the early morning when surfaces are wet.

KEEP CLEAR

Keep Clear. (It is dangerous to be in this area when the machine is operating.)

SAFETY - General

N.B. Throughout this manual important safety information is indicated by these symbols in the margin:



NO RIDE

A prohibition should be observed under all circumstances.



WARNING

A warning indicates a hazard that could cause death or injury if the warning is ignored.



CAUTION

A caution indicates a hazard that may cause damage to property if the caution is ignored.

This section of the manual offers general guidelines for the safe operation of machinery. It does not replace local safety regulations. These guidelines were current at the time of publication, but may be superseded by later regulations.

Clough Agriculture has made every effort to highlight all risks to personnel or property. Owners and operators have a responsibility to exercise care and safe work practices at all times in the vicinity of the machine.

Owners are advised to keep up to date on safety issues and to communicate these to all users of the machine.

Contact the Occupational Safety and Health Service (OSH) for further information about general safety aspects. If you have safety concerns specifically related to this machine, contact your dealer immediately.

Operator Safety

Read this manual carefully before operating new equipment. Learn how to use this machine safely. Be thoroughly familiar with the controls and the proper use of the equipment before using it.



Take careful note of all safety instructions both in this manual and on the machine itself. Failure to comply with instructions could result in personal injury and/or damage to the machine.

Replace missing or damaged safety signs on the machine and ensure that these remain clearly visible.

It is the owner's responsibility to ensure that anyone who operates, adjusts, lubricates, maintains, cleans or uses the machine in any way has had suitable instruction and is familiar with the information in this manual (particularly with regard to safety aspects).

Operators and other users of the machine should be aware of potential hazards and operating limitations.



Be Prepared for Emergencies

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance, hospital and fire department near your telephone.



SAFETY - General (Continued)



Appropriate Dress

Wear close fitting clothing and avoid rings or other forms of jewellery which could become caught in the machinery.

People with long hair must have it securely fixed and confined close to the head.

Refer to local safety standards for protective clothing and recommended safety equipment.



Transport This Machine Safely

Ensure that all linkage pins and security clips are fitted correctly. With trailing machines tow with the drawbar only, as this is the only safe towing point on the machine.

Always check that bystanders (especially children) are well clear (front and rear) before starting and moving the tractor and the machine.

Plan safe routes of travel, and be aware of power lines and other roadside hazards. Take particular care when towing implements on hillsides.

Do not ride or allow passengers on the machine.

This machine is not designed to carry passengers, and no riders are permitted.



Road transport

On public roads,

- A speed of 30km/h must not be exceeded.
- Do not operate during the hours of darkness unless standard lights are fitted and clearly visible. (This also applies when visibility is limited, e.g., in foggy conditions.)

See the guidelines in the *Vehicle Dimensions and Mass Rule*, issued by the Land & Transport Safety Authority.

Avoid tip-overs

Avoid holes, ditches and obstructions which may cause the machine to tip over, especially on hillsides. Never drive near the edge of a gully or steep embankment - it might cave in. Slow down for hillsides, rough ground and sharp turns.



SAFETY - General (Continued)

Handle Agricultural Chemicals Safely

All farm chemicals should be stored, used, handled and disposed of safely and in accordance with the supplier's/manufacturer's recommendations.



Read the product label before using, noting any warnings or special cautions, including any protective clothing or equipment that may be required, ie. respirtor.

Do not eat or smoke while handling sprays, fertilisers, coated seeds, etc. Afterwards, always wash your hands and face before you eat, drink, smoke, or use the toilet.



Store sprays, fertilisers, coated seeds, etc. out of reach of children and pets, and away from food and animal feeds.

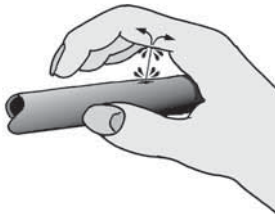
Any symptoms of illness during or after using chemicals should be treated according to the supplier's/manufacturer's recommendations. If severe, **call a physician or get the patient to hospital immediately**. Keep the container and/or label for reference.

Avoid High Pressure Fluids

Avoid any contact with fluids leaking under pressure, because the fluids can penetrate the skin surface.



Any fluid which penetrates the skin, will need to be **removed immediately by a medical expert**. Seek specialist advice on this type of injury.



Relieve the pressure before disconnecting any hydraulic or other lines. Make all repairs and tighten all fittings before re-connection to pressurised fluid.

Keep your hands and body away from any pinholes or high pressure jets. Search for leaks with a piece of cardboard instead of using your hand directly.

Safe Work Practices

All farm machinery is potentially dangerous and should be treated with caution and respect.



Before starting the machine, ensure that all controls are placed in neutral and that bystanders are well clear. Check that the guards have been securely fitted and that any adjustments have been made correctly.

Where possible, disconnect or isolate the drive mechanism to the implement. Lower the machine onto the ground when not in use.

SAFETY - General (Continued)



WARNING

Practise Safe Maintenance

Keep the machine in safe working condition. Routine maintenance and regular servicing will help reduce risks and prolong the life of the machine.

General Maintenance

Accidents occur most frequently during servicing and repair. The following general rules must be followed when maintaining or working with machinery:

- All operating and maintenance manuals must be read
- before and referred to while using or servicing any piece of equipment.
- Turn off all machinery power sources and isolate the machine before making adjustments, doing lubrication, repairs or any other maintenance on the machine.
- Ensure that the machine hydraulics are disconnected from the power source.
- Wear gloves when handling components with cutting edges, such as any ground cutting components.
- Beware of hazards created by springs under tension or compression when dismantling or maintaining the machine.
- It is recommended that you clean the machine with a water blaster or similar apparatus before commencing maintenance.

Make Sure the Machine is Well Supported

When machinery is fitted with hydraulics, do not rely on the hydraulics to support the machine. During maintenance or while making adjustments under the machine, always lock the hydraulics and support the machine securely. Place blocks or other stable supports under elevated parts before working on these.



Electrical Maintenance

Disconnect the electrical supply from the tractor before doing any electrical maintenance.



CAUTION

Welding

With electronic equipment in modern tractors it is advisable to disconnect the machine from the tractor, or at least disconnect the alternator and battery before attempting any welding.



CAUTION

Use Only Genuine Spare Parts

Unauthorised modifications or non-genuine spare parts may be hazardous and impair the safe operation and working life of the machine.

Excess lubricants must be disposed of safely so as not to become a hazard.

SAFETY - Machine Specific

This section of the manual gives specific guidelines for the safe operation of the Roller Drill.

These guidelines were current at the time of publication, but may be superseded by later circumstances. They do not necessarily cover every possible hazard and must be read in conjunction with the **SAFETY - General** section (Page 4 - 8).

Hazard Points on the Roller Drill

The lists below are not all-inclusive and serve only to highlight the more obvious areas of risk.



The decals attached to the machine are a general reminder that there are hazardous areas on the machine, rather than specifically highlighting all possible hazards.

For decal locations on machine, refer Page 11.



No Ride

Passengers are not permitted anywhere on the machine.



Pinch Points/Moving Parts

Hazardous areas include:

- Drive chains.
- Sprockets between the drive axle, the clutch shaft and the gearbox (RH side).
- Sprockets between the gearbox and the box shafts (RH side).
- Agitator drive units (LH side).
- Agitator shaft inside the boxes.
- Seeder units, box shaft and shaft connectors.
- Rear wheel frame and linkages.
- Roller rings (externally and internally).



**Slippery
When
Wet**

Slippery When Wet

Hazardous areas include:

- Footboard and footsteps.
- All smooth surfaces on the frame structure.

KEEP CLEAR

Keep Clear

Hazardous areas include:

- Between the tractor and Roller Drill.
- Immediately adjacent to the Roller Drill side.

SAFETY - Machine Specific (Continued)



Hazard Points on the Roller Drill (Continued)

Chain Guards & Access Covers

To prevent hands, etc. getting caught in the gearbox drive chain, a guard is provided to cover sprockets, chain and chain tensioner mounted on the side of the mainframe side plate. A guard is provided to cover the seedbox drive chains at the rear of the gearbox. A two piece guard is also provided to cover the sprockets, chain and chain tensioner driving from the roller axle. All these guards must be fitted while using the machine.

Warning: Access to pinch points is still possible from underneath the guards.

For guard locations on machine, refer Page 11.

Calibrating

Be particularly careful when calibrating the seeding rate. At this time, the calibration trays have been removed and are no longer covering the rotating seeder units. See **Pinch Points/ Moving Parts** (Page 9) for hazardous areas.

Transport

If fitted; the two large wheels at the rear of the machine are for the purpose of transportation. They support and lift the machine when linked to the tractor. After fitting the roller transport chain (Refer P13) and raising the machine for transport lock the hydraulics by use of the ball valve (tap) attached to the rear of the hydraulic cylinder. Refer **Transportation** Section P12.



When towing using the transport wheels the roller must be fully raised with the roller support chain correctly fitted.

Ensure that all linkage pins, security clips and safety chains are fitted correctly.

Important - Refer to safety cautions in the **Transportation** section, Page 12 of the manual.

Maintenance

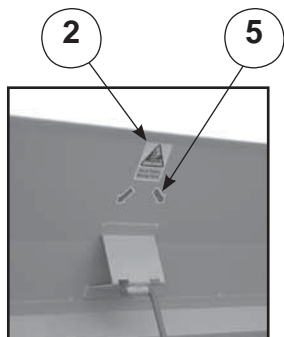
Refer Page 24 - 29 for the **Maintenance and Care** section of the manual.

Lubrication

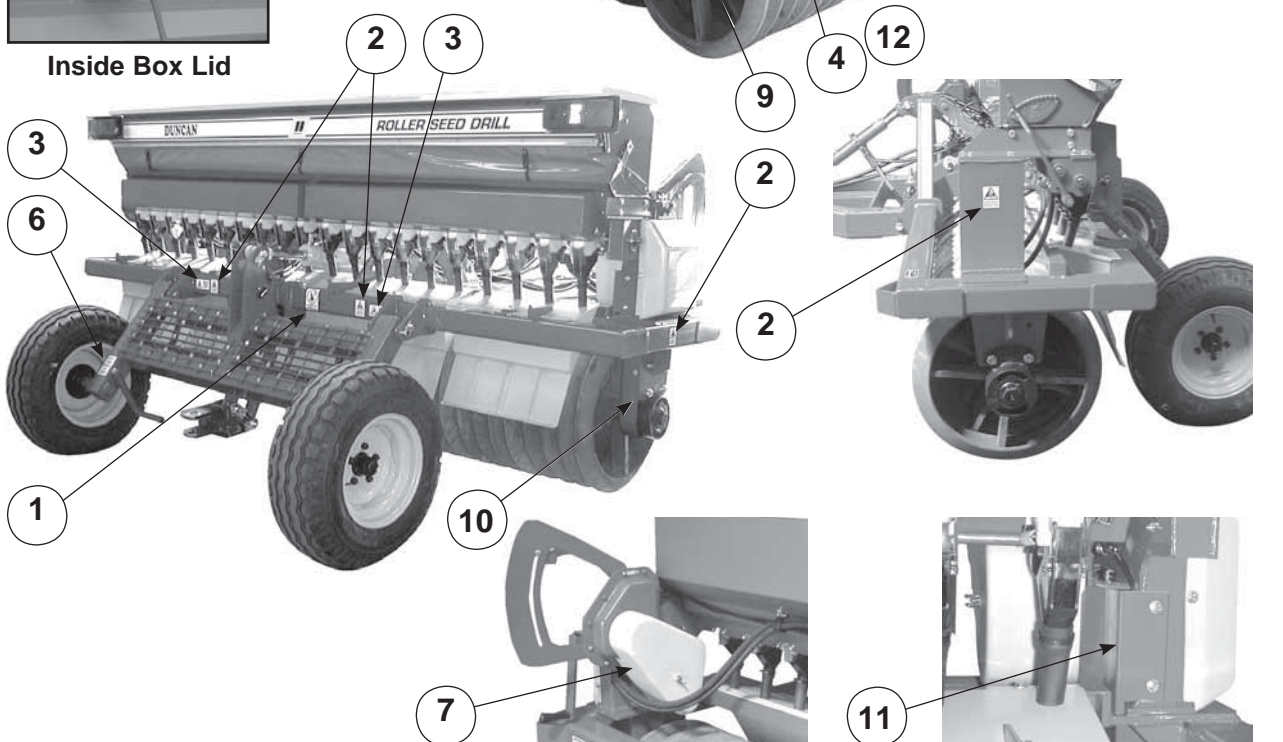
Refer Page 25 for the **Lubrication** section of the manual.

SAFETY - Machine Specific (Continued)

Safety Decals & Safety Guards



Inside Box Lid

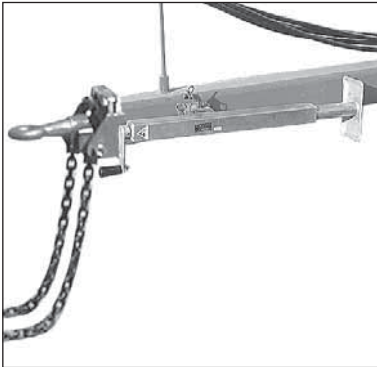


Item	Decal/Guard	Pt. No.	Qty
1	'No Ride'	43900	3
2	'Pinch Point/Moving Parts'	43901	5
3	'Slippery When Wet'	43902	2
4	'Keep Clear'	43904	2
5	Arrows (Inside Box Lid)	43905	4
6	Don't Use Wheel As Step	43709	2
7	Guard (Clutch to Gearbox)	24087	1
8	Guard (Gearbox to Seedbox)	24390	1
9	Lower Chain Guard (Front)	24078	1
10	Lower Chain Guard (Rear)	24082	1
11	Inner Chain Guard (Lower)	24085	1
12	'30km/hr'	43911	2

Transportation



Towing on the Road



- 1 Locate jack stand in transport position. Refer Fig 1.
- 2 Raise the drill into the transport position using the main hydraulic ram.
- 3 **Important** - To avoid machine damage due to drill lowering during transport, always close the hydraulic valve on the rear of the main ram at the base of the drawbar. Move the handle to a position at 90° to the hydraulic line. Refer Fig 2.
- 4 Ensure lighting and oversize warning requirements meet recommendations published by the local Land Transport Authority or equivalent.

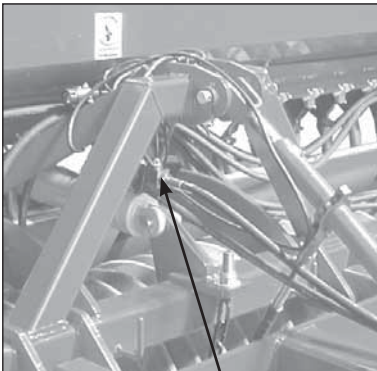


- 5 **Maximum towing speed 30 km/hr.**
For countries other than New Zealand greater speed restrictions may apply, please refer to your local transport authority.

Ensure towing vehicle requirements are adequate for the towed vehicle e.g. mass, brakes. Refer to recommendations published by the local Land Transport Authority or equivalent.

Braking when towing can cause the load to jackknife. Use extra care when towing in adverse conditions such as mud, inclines and sharp bends.

Lower towing speeds are recommended on farm roads/tracks and where one wheel is on or over a road verge.



Hydraulic Valve



- 6 **Attach safety chains to tractor.** Refer Fig 3. Safety chains must be crossed over underneath the coupling and attached to the towing vehicle. The attachment points must be as close as practical to the tow coupling and one each side. The towbar on the towing vehicle must be rated for the towed mass. **Do not remove or replace the safety chains provided with any other than those specified in the parts manual.**

Note: The safety chains are provided with sufficient length to cater for all towing vehicles. Safety chains must be shortened by cutting off excess length so that if the coupling fails the drawbar will not hit the ground.



fig 3



- 7 **Important** - Check tyre pressure before transporting. Refer P 3.

Use of Transport Support Chain

A transport support chain (fig 4) is supplied to prevent the ring shaft sagging during transport, it is important this is used and fitted correctly using the following procedure:-

- 1 Lower transport wheels lifting rings 125 - 150mm clear of the ground, unhook transport chain from storage position and lay it on the ground. Drive slowly forward until chain is trailing in a straight line to the rear.
- 2 Lower machine back onto the ground.
- 3 Remove "R" clip and chain anchor pin, Fig 5/1, at the rear. Pull the chain up and fit the pin through a link with the chain as tight as possible and replace "R" clip.
- 4 If required this chain may be tightened further using the adjustment nut at the front of the machine. Refer Fig 5/2.

Consequences of not using transport chain include:-

- 1 Damage to machine.
- 2 Strain on axle bearings and mounts.
- 3 Strain or breakage of roller axle.

Operation

General Operation Guidelines

- 1 Use a sufficiently powerful tractor which is heavy enough to tow the drill safely.
- 2 Operate the drill at a speed of 6-10 km/hr (4-6 mph). These are typical speeds in good conditions. In adverse conditions a lower speed is recommended to minimise rapid part deterioration or damage. Operating at too high a speed can also result in greater vibration & uneven seed flow at low seeding rates.
- 3 Check that the drill is level during calibration and operation.
- 4 After prolonged storage, check to see that all drive mechanisms and hydraulic equipment are functioning correctly.
- 5 Handle and apply chemically treated seeds according to the manufacturers recommendations. Refer safety section.
- 6 Double check seed rates before seeding.

Transport Chain



fig 4

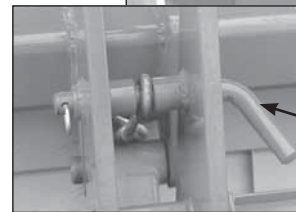
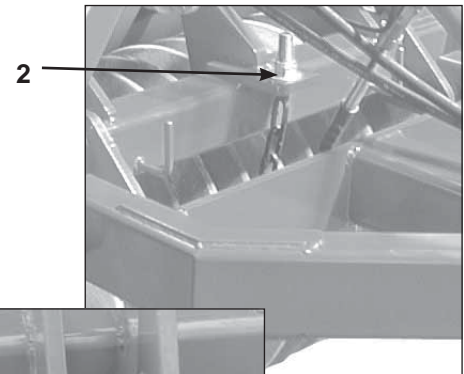


fig 5

Roller Drill Sowing Chart

(Row Spacing 150mm)

Test Seed Type/ Thousand Seed Wgt., TSW*(gm)	H/L	Shutter Slide* Bottom Flap* Metering Wheel*		Seed Rate (kg/ha)										Hints		
				Gearbox Setting Position												
				15	20	30	40	50	60	70	80	90	100			
Wheat (41.2)		3/4	3	N												
Oats (37.2)		Full	3	N												
Barley (45.7)		Full	3	N												
Peren. Grass (2.27)		Full	3	N												
Annual Grass (4.4)		Full	3	N												
Pasture Mix* (-)		Full	3	N												
Lucerne (3.17)		3/4	1	F												Agitator Stopped
Turnip (2.17)	L	3/4	1	F	1.23	2.24	4.10	5.90	7.66							Agitator Stopped
Kale (3.20)	L	3/4	1	F		2.16	4.10	5.94	7.68							Agitator Stopped
Swedes (3.25)	L	3/4	1	F	1.20	2.11										Agitator Stopped
Rape (3.50)	L	3/4	1	F		2.07	3.83	5.66	7.37							Agitator Stopped
White Clover (1.11)	L	3/4	1	F	1.04	2.00	3.90	5.70	7.20							Agitator Stopped
Red Clover (2.23)	L	3/4	1	F		2.42	4.54	6.44	8.49	10.42	12.44					Agitator Stopped

Bottom Flap*: The values shown were the optimum test settings, decreasing the gap may cause seed damage, too large a gap will give intermittent flow rates. (Flaps are spring loaded to cope with small variations in seed/granule size).

Metering Wheel*: N = Normal Metering Wheel
F = Fine Seed Metering Wheel

fig 6

Shutter Slide*: For Grain, changing the Shutter Slide from 3/4 to Full gives 10% to 15% more flow.

Pasture Mix*: Test Mixture = 72% Perennial Grass, 8% White Clover, 8% Cocksfoot, 8% Concord, 4% Red Clover

TSW*:
$$\frac{\text{TSW}(\text{gm}) \times \text{Desired Plants}/\text{m}^2}{\text{Germination \%}} = \text{Sowing Rate (Kg/Ha)}$$

Basic Calibration Procedure

Gearbox Setting Lever

To set the seed rate at the gearbox, slacken the star knob by turning counter-clockwise and move into the position indicated in the Sowing Chart. Retighten the star knob firmly.

Refer Fig 7.

Important

The settings shown in the Sowing Charts (kg/ha) can only serve as reference values. Deviations may occur caused by differences in the size, shape, density of the seed and by the dressing agent. **Therefore prior to any sowing, always carry out calibration trials to accurately determine the actual seed rate.**

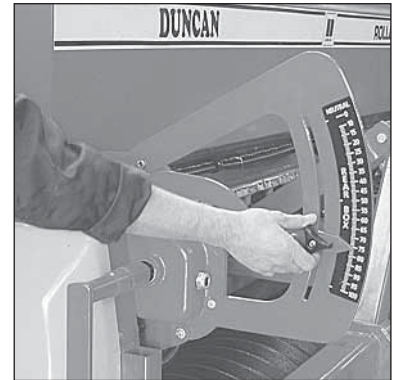


fig 7

Using the stepless variable speed gearbox, the speed of the metering shaft and thus the seed rate is set steplessly. The higher the figure indicated on the scale (Fig 7) by the setting lever the greater the seed rate.

Selecting the Gear Ratio

When required to operate at high seed rates the clutch output sprocket is set at 19 tooth and the gearbox input at 15 tooth.

This is the standard setting as supplied ex the factory. (Referred to as the **High Speed Setting**). Refer Fig 8 and to P20, Fig 17.

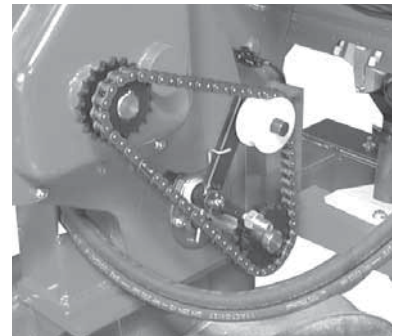


fig 8

The alternative setting for lower seed rates is to reverse these two sprockets so that the clutch output is 15 tooth and the gearbox input is 19 tooth.

(Referred to as the **Low Speed Setting**).

Refer to P20, Fig 18.

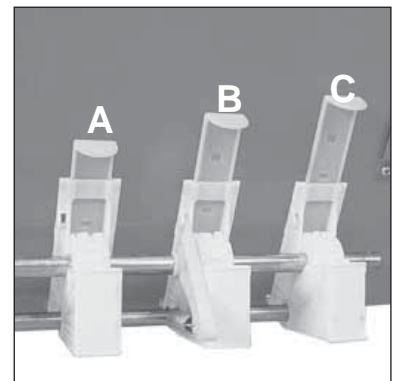


fig 9

Setting Seeder Shutter Slides

The varying flow properties of seeds require different shutter slide positions which may be found in the Sowing Chart for the individual type of seed. This corresponds to one of the three settings in Fig 9.

Fig17/A	Fig17/B	Fig17/C
Closed	3/4 Open	Fully Open

Bottom Flap Settings

The various seed sizes require matching bottom flap clearances below the metering wheel. The adjusting plate allows for 10 different settings. The required position for the seed type may be found in the Sowing Chart. The control levers are located on the LH end of the seedbox, (opposite end to the gearbox).

Number "1" corresponds to the minimum (closed) position and "10" the maximum gap.

Refer Fig 10.

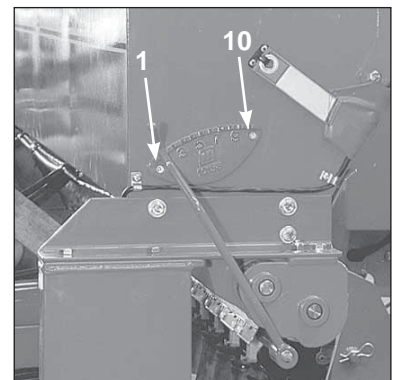


fig 10

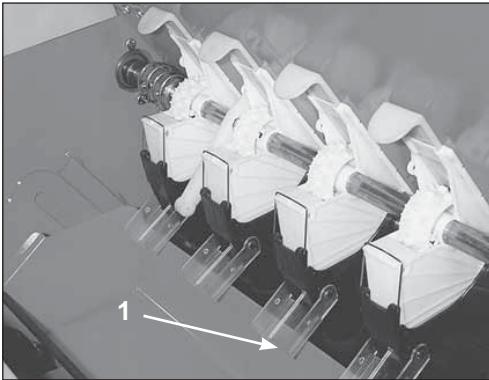


fig 11

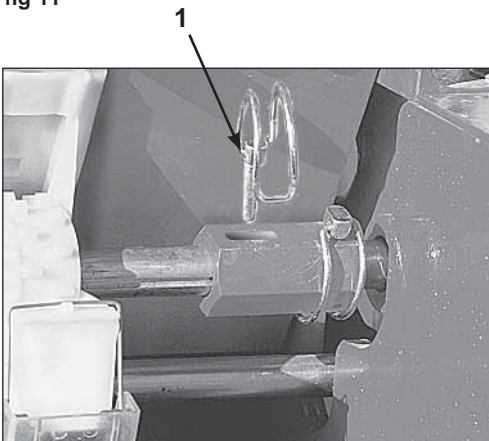


fig 12

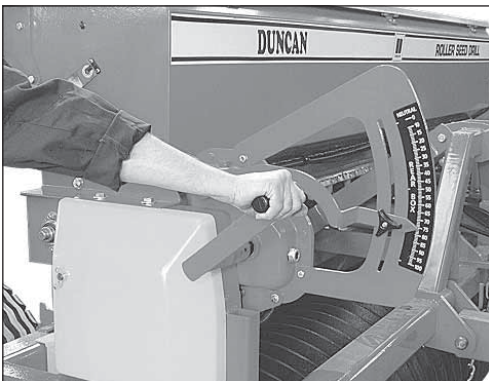


fig 13

Seed Calibration

The calibration test should be done to confirm the required seed rate and is done with the drill stationary and level.

Seed Calibration Procedures

- 1 Remove the calibration tray from the brackets on the seedbox. Place the tray (or trays) on the support members below the seeders.
- 2 Position all the clear plastic seed diverters to redirect the seed into the calibration trays as in Fig 11/1.
- 3 Make sure **all the shutters** are open and set to the position indicated in the seed charts for your particular seed. Refer P 14, Fig 6 & P 15, Fig 9.
- 4 Agitator Shaft - Check the seed chart for hints on whether to connect or disconnect this shaft during seeding. Refer P 14, Fig 6 & Fig 12/1.
- 5 For the test, half fill the box with seed. If this is not possible make sure the seed is evenly distributed within the box.
- 6 Now the 3 basic settings must be made using the figures from the Sowing Charts P 14. For setting method refer...

P 15. Gearbox Setting Lever.

P 15. Selecting the Gear Ratio.

P 15. Setting Seeder Shutter Slides.

P 15. Bottom Flap settings.

Note For seeds which are not covered in the Sowing Chart, use the figures for a seed of comparable size and shape.

- 7 Place the crank handle over the hexagonal drive dog on the gearbox input shaft and turn clockwise until the seed flows consistently from the seeders. To ensure complete filling of the seed unit continue turning the crank until the calibration tray is approximately half full then empty into the seedbox. The drill is now ready for calibration. Refer Fig 13.
- 8 Turn the crank handle the required number of revolutions as in the table on P 17.

Note The Calibration is usually done for 1/40th hectare. For very small seed rates or when using inaccurate scales (i.e. unable to measure to the nearest gram) the calculation based on 1/10th hectare should be used.



Scales must be accurate to 2 grams as any error can be multiplied by up to 40 giving inaccurate calibration results.

Number of Hand Crank Turns for Seed Rate Calibration

The figures represented below are for arable conditions (**worked ground**) and are calculated to indicate an average situation. If there is any doubt as to the accuracy of these figures for the conditions, it is advisable to run at least 1 of the 2 checks on the calibration figures listed. Refer P 18, **Recalculating the Constant**, and/or P 19, **Roller Ring Slip Deviations**.

Machine Size	Sowing Width (m)	Turns for		
		1/40	1/10	
8 ft	2.37	31.5	125	Low Speed
9 ft	2.67	28	111	
10 ft	2.97	25	100	
8 ft	2.37	50	201	High Speed
9 ft	2.67	44.5	178.5	
10 ft	2.97	40	160.5	

Speed Setting	Gearbox Sprocket	Clutch Sprocket
Low Speed (Standard)	19 Tooth	15 Tooth
High Speed	15 Tooth	19 Tooth

9 Weigh the seed collected during the test in kilograms

10 Calculate the seed rate by multiplying the kgs previously collected x 40 (1/40th ha method) or x 10 (1/10th ha method) depending on requirement. If the resultant calculation does not produce the desired seed rate use the enclosed seed rate calculator disc to determine the correct gearbox setting.

For $\frac{1}{40}$ Hectare (250 m²) Calibration
Seed Rate = Actual Seed Collected (kg) x 40

For $\frac{1}{10}$ Hectare (1000 m²) Calibration
Seed Rate = Actual Seed Collected (kg) x 10

Refer **Use of Seed Rate Calculator** P 18.

Suggestion To be on the safe side and until confidence has been gained with the method of calibration it is advisable to conduct a second test at the newly determined gearbox setting.

11 Where a coated seed is used it is advisable to check the calibration after 1 hectare as dressings can tend to create a coating on the seed metering wheels thus changing the the flowing properties of the seed which in turn alters the seed rate.

Calculating Number of Hand Crank Turns for Other Working Widths

1 For clutch output sprocket of 15 tooth and gearbox input sprocket of 19 tooth (standard **Low Speed Setting**)...

$$\text{Crank Turns} = \frac{\text{Area in Metre}^2}{\text{Working Width}} \times \text{Constant}$$

Constant (For Crank Turns) = 0.2968

2 For clutch output sprocket of 19 tooth and gearbox input sprocket of

Recalculating the Constant

It is especially important in arable situations to check the rolling circumference of the Roller Rings when in the cultivated area to be sown, and if necessary, recalculate the constant and hence the number of crank turns.

If there is a significant difference at that time from the figure used for calculations in this manual (Fig 14), the constant should be recalculated and hence the crank turns for those particular conditions.

Note - If a significant difference is found in the rolling circumference the 'Manual Ratio' setting should also be adjusted on the hectaremeter. Refer P 22.



$$\text{Low Speed Constant} = \frac{0.5639}{\text{Rolling Circumference of Roller Ring}}$$

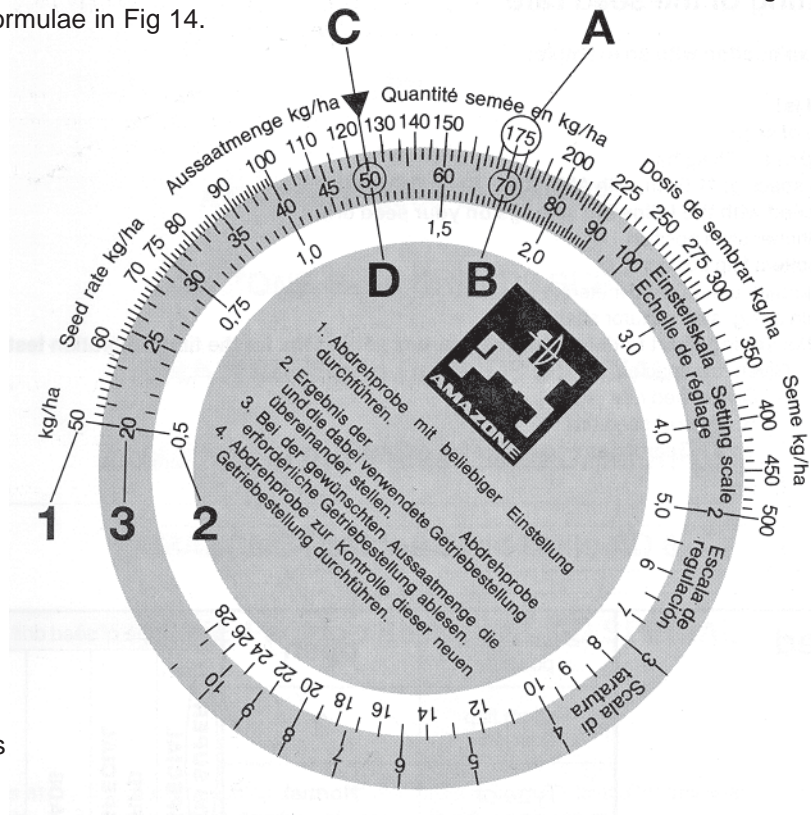
$$\text{High Speed Constant} = \frac{0.9048}{\text{Rolling Circumference of Roller Ring}}$$

Rolling Circumference used for calibration was... 1.9 metres

1 To recalculate the constant due to altered conditions or specific requirements use the formulae in Fig 14.

2 To obtain the rolling circumference of the roller ring
1/2 fill the seed/fertiliser boxes or simulate this loading.
Mark an end ring of the drill at 90° to the ground and the point of contact with a mark on the ground. Move the drill forward 3 revolutions until the mark on the ring is again at 90° to the ground. Measure the distance along the ground and divide by 3 to give the rolling circumference of the roller ring.

fig 14



Use of Seed Rate Calculator

Determining the gear box scale setting using the calculator.

Usually the first calibration test yields a different seed rate. However with the value determined from the first test it is possible to determine the correct gearbox setting with the aid of the enclosed disc calculator, Fig 15. The disc calculator

Setting Example (Desired seed Rate 125kg/ha)

- 1 From the calibration procedure (described on P 16,17) at a gearbox lever setting of "70" a seed rate of 175 kg/ha was obtained.
- 2 Turn the inner disc until the measured seed rate of 175kg/ha (Fig 15/A) is in line with the related actual gearbox setting of "70".(Fig 15/B)
- 3 Read off from the disc rule the necessary gearbox setting for the required seed rate of 125kg/ha (Fig 15/C) In this example the correct setting is "50" (Fig 15/D)
- 4 To be on the safe side the new gearbox setting can be checked by another calibration test.

Calibration Deviations

Deviations Between the Calibration Test and the Actual Seed Rate

The most frequent cause for changes between the calibration test and the seed rate lies in the flowing properties of seed during sowing. These changes in properties generally result from reactions of the dressing agents to temperature, humidity or abrasion. These changes will become even more obvious when the bottom flaps are incorrectly set. If the setting of these flaps leaves too large a gap an uncontrollable additional flow of seed can occur during seeding; especially when assisted by the drill bouncing, a condition not simulated while conducting the calibration tests. For this reason the basic setting of the bottom flaps should be checked at regular intervals. For more details refer P 29, Fig 28 & 29.

Residues from the seed dressing on the bottom flaps and metering wheels can also influence the flowing properties of the seed and thus the seed rate. In such cases a balance will occur only after a period of time and it is recommended to repeat the calibration test to confirm the seed rate after 2-3 seedbox fillings, nominally when the seed box is half empty. Only then will a balance occur and the seed rate will stabilise.

Roller Ring Slip Deviations

It is always possible in extreme ground conditions to get Roller slip. Not normally a problem in good conditions, but more so in the arable situation. The result; large differences between the calibration test and the actual sowing rate, obviously less seed deposited than required. The number of crank turns indicated in the table on P 17 is correct in most circumstances other than those mentioned above; however soft seed beds and a fully laden machine can affect the effective rolling circumference of the Ring.

Should you require to check this due to some unforeseen circumstances proceed as follows...

Measure an area of 250 m² (1/40 Hectare) - this corresponds to a machine travel of... Refer Fig 16.

Machine Size	Sowing Width (m)	Travel Distance
8 foot	2.37	105.5m
9 foot	2.67	93.5m
10 foot	2.97	84.0m

fig 16

For this calibration test place the crank handle over the hexagonal drive dog on the gearbox input shaft. Now move the machine forward over the measured distance, counting the number of turns of the crank handle as you go. Using this number of crank turns repeat the calibration.

Hints for Sowing with Variable Speed Gearbox

This gearbox allows for stepless changes in the speed of the metering shaft and thus the seed rates. Due to the variations in seed type and application rates there are 2 speed ranges available.

By changing from High Speed to Low Speed the range of settings and control is dramatically increased. The machines are supplied ex the factory set to the high speed configuration. Change to the Low Speed when the gearbox setting is down to 10 on the scale and the desired seed rate cannot be obtained. To change the speed setting remove the chain cover (Fig 17). Then loosen the grub screws in both sprockets, release the tension from the chain, remove sprockets and chain together and interchange as in Fig 18. Align sprockets, and retighten all grub screws. Replace guard and calibrate as required.

To Determine the Gearbox Setting after a Speed Change

For determining the correct gearbox setting after the speed change, conduct the first test at 50. With the weight of seed collected find your correct setting with the aid of the disc calculator refer P 18, Fig 15.

Sowing of Fine Seeds

For sowing fine seeds the Roller Seed Drill is equipped as standard with a combined normal and fine seed "Elite" metering wheel (Fig 19/1).

During grain sowing and other larger varieties of seed both the normal and fine seed metering wheels are coupled and both rotate. In order to convert the seed drill to sow fine seed insert the crank handle and rotate clockwise until the holes (Fig 19/2) of the fine seed wheel are visible. Using the tool supplied (Fig 20/1) disengage the the pin inside the hole so that the normal metering wheel rotates freely on the metering shaft.

At this time it would be advisable to close any shutter slides not required for the fine seed sowing.

When seed is to be sown again using the normal metering wheel press the pin, from the normal metering wheel side (opposite direction to before), using the tool, back into the hole of the fine seed wheel thus reconnecting the drive between the two.

High Speed

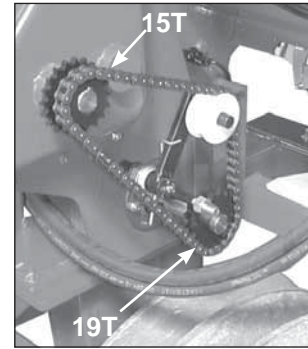


fig 17

Low Speed

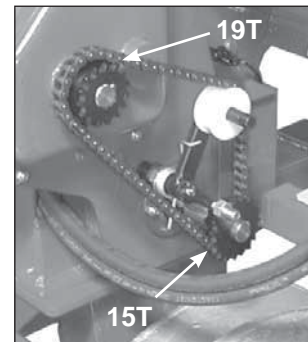


fig 18

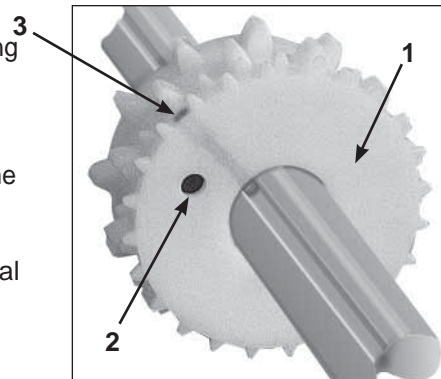


fig 19

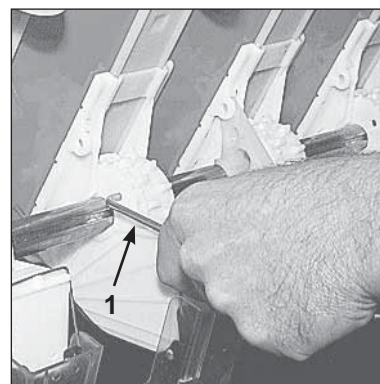
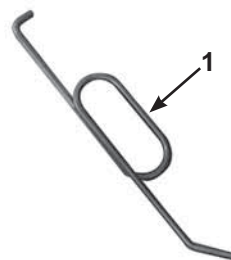


fig 20

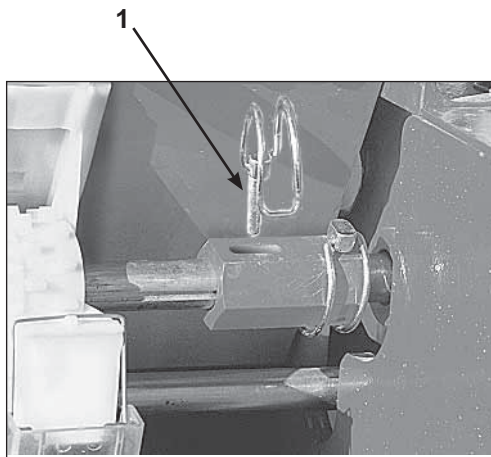


fig 21

Small Seed Calibration with Disconnected Agitator Shaft

The fine seed metering wheel used in Clough Drills is especially well suited for sowing small seeds such as rape. Due to the intensive action caused by the agitator the seeds can adhere to each other, or be damaged, causing irregular sowing/germination. **Therefore it is recommended that when sowing small seeds, especially oil seeds and thin shelled seeds, the drive to the agitator is disconnected.** To do this remove the lynch pin as shown in Fig 21/1.

Deviations between the calibrated and actual seed rate can occur when residual dressing agent sticks to the bottom flaps and thus slows the flow of seed. Before beginning

the actual calibration test fill the calibration trays by turning the crank handle at a high speed around the 90 setting on the gearbox scale. This will cause an immediate buildup of the dressing agent on the flaps. Return the contents of the calibration trays to the seed box and proceed with the actual calibration. Due to the residue buildup on the flaps your calibration will now reflect accurately the required seed rate.

It is advisable with small seeds to use the 1/10 hectare method for your calibration, thus cutting down on weighing errors.

Note - Remember to reconnect the agitator shaft as required for other seeds otherwise the consistency of seed rate will be affected.



Caution - When resetting the metering wheels on the seeder shaft

Care should be taken when tightening the grub screws (P 20 Fig 19/3) on the fine seed wheel. Adjust the grubscrew until the movement of the metering wheel just stops, then tighten no more than 1/8 of a turn.

Do not overtighten as this can result in breakages while operating and may render the warranty on these units void.

Farmscan Jackal v3 Settings Setup

Refer to the manual supplied with your Farmscan Jackal kit for information and operation.

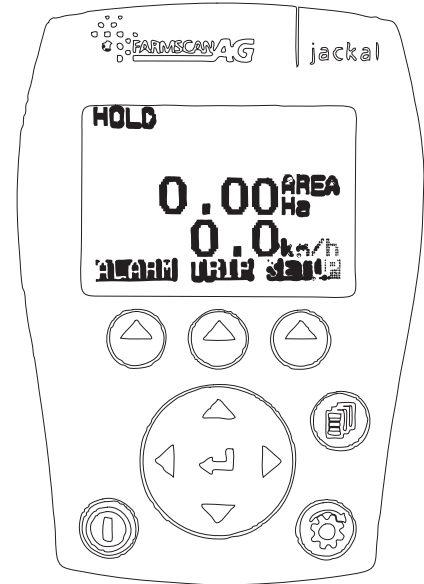
Farmscan Jackal v3 Factory Setup for Roller Drill

Refer to pages 6,9,11 of the Farmscan Jackal v3 manual.

Input 2 -Two wire 'reed' sensor for 'Area/Speed Wheel' measurement taken from shaft on drive pedestal.
The white 'signal' lead is connected to input A2.

Input 2 Edit	
m/pulse	
Auto Set:	
Target:0.000m	
Meas.pulses:	0
Manual Ratio:	2.66000
NEXT	EDIT

Other Settings	
Implement Width:	x.xxx m
Extern.Run/Hold:	Disabled
Alarm Beep:2	
NEXT	EDIT



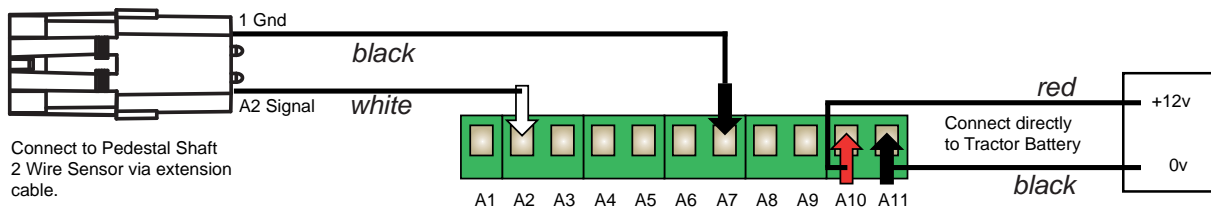
The 'drive ratio' from roller rings to sensor is always 23/35 = 0.7143

$$\text{Manual Ratio} = \frac{\text{Circumference of Rings}}{\text{Drive Ratio}}$$

$$= \frac{1.9 \text{ m}}{0.7143}$$

$$= 2.66 \text{ m}$$

Machine Size	Sowing Width (m)
8'	2.37
9'	2.67
10'	2.97



Refer to the Farmscan manual if you want to make additional sensor connections.

It is advisable, as with all things electronic, to have a backup of your totals. We suggest you record these on a daily basis in a notebook or diary.

Maintenance & Care

General Safety and Accident Prevention Advice



- 1 Make sure that if the tractor remains attached to the drill and that the ignition key is removed.
- 2 During maintenance the drill should be supported in such a manner that if hydraulic failure was to occur the machine would still be adequately supported.
- 3 Disconnect the electrical supply from the tractor before doing any electrical maintenance.
- 4 Refer to safety sections for more safety information.

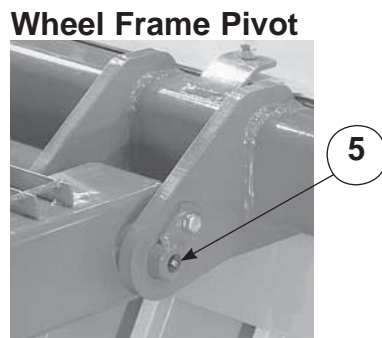
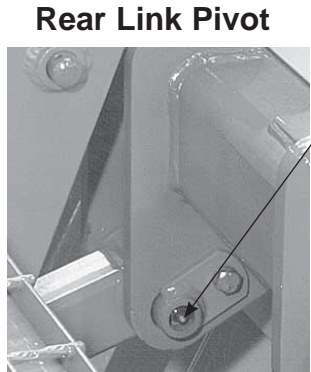
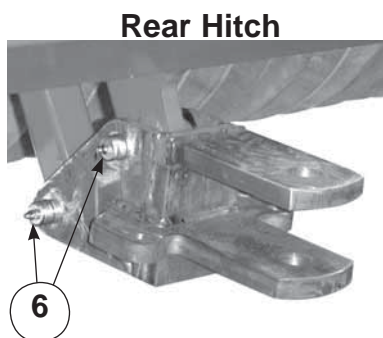
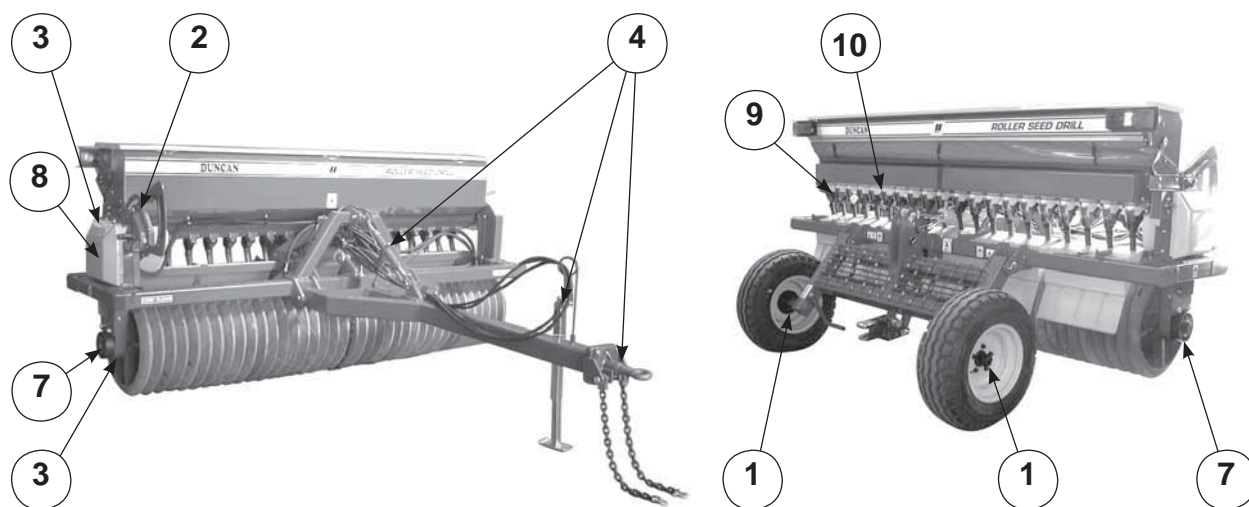
General Cautionary Maintenance Advice

- 1 **Electric Welding** - With the electronic equipment in modern tractors it is advisable to completely disconnect the implement from the tractor, or at the very least disconnect the alternator before attempting any welding.
- 2 **Hydraulics** - Ensure hydraulic couplings (male & female) are clean before connecting. Dirty couplings will result in hydraulic oil contamination and hydraulic cylinder seal damage and bore scores. This in turn will result in oil leakage past the piston seals.
No filter is fitted to the hydraulic system. If hydraulic fittings and oil supply are not going to be kept clean it is recommended that a filter be fitted to prevent hydraulic cylinder damage.
- 3 **Water Blasting** - Water blasting, steam cleaning or other pressurised cleaning processes can force dirt etc. into undesirable places that may cause damage or rapid part wear to items such as bearings, seals, chains, bushes etc. Caution must be exercised.



Lubrication

Your new Duncan Roller Drill will give long and efficient service if given normal care and maintained properly.



Lubrication Chart

Item	Components	Lubricant	*Frequency
1	Wheel Bearings	Castrol LMX Grease	Annually
2	Gearbox	Castrol Hyspin AWH 32/68 Oil (1 Litre)	Maintain Level
3	Drive Chains	Suitable Roller Chain Lubricant	6 Monthly
4	Jack, Turnbuckle, Tow Eye	Castrol LMX Grease	6 Monthly
5	Wheel Frame Pivot	Castrol LMX Grease	Weekly
6	Hitch Pivots	Castrol LMX Grease	Weekly
7	Roller Bearings	Castrol LMX Grease	Monthly
8	Clutch/Box Shaft Bearings	(Pre-packed & Sealed)	Not Required
9	Agitator Shaft	Nylon Bushes	Not Required
10	Seeder Shafts	Nylon Supports	Not Required

* The lubrication frequencies are only a guide. Actual frequency will depend on extent of use & ground conditions.

Precautions with Grease

Greases should not be mixed as the structure may be weakened by the mixing of different types of thickener which may cause softening and loss of grease from bearings by running out.

Maintenance Schedule

Components	Daily (or after 20Ha)	Weekly (or after 100Ha)	Pre Season (or 1000 Ha)
Roller Rings for Looseness	•	•	•
Seeders/Agitators/Bottom Flaps	•	•	•
Transport Wheel Nuts		•	•
Pivot Pin Fasteners		•	•
Coupling/Safety Chains		•	•
Transport Chain		•	•
Roller Drive Chains		•	•
Gearbox/Clutch		•	•
Hydraulics (Oil Leaks)		•	•
Bolted Connections		•	•
Tyre Pressures (Refer P3)		•	•
Framework			•

Maintenance of Roller Rings

The roller rings are kept pressed together by a series of disc springs (Belleville Washers) and spacer rings. Because the cast rings are free to rotate on the axle independently the rings will wear. If this exceeds the amount able to be taken up by the disc springs an extra spacer ring should be fitted.

Signs that indicate a spacer ring should be added:-

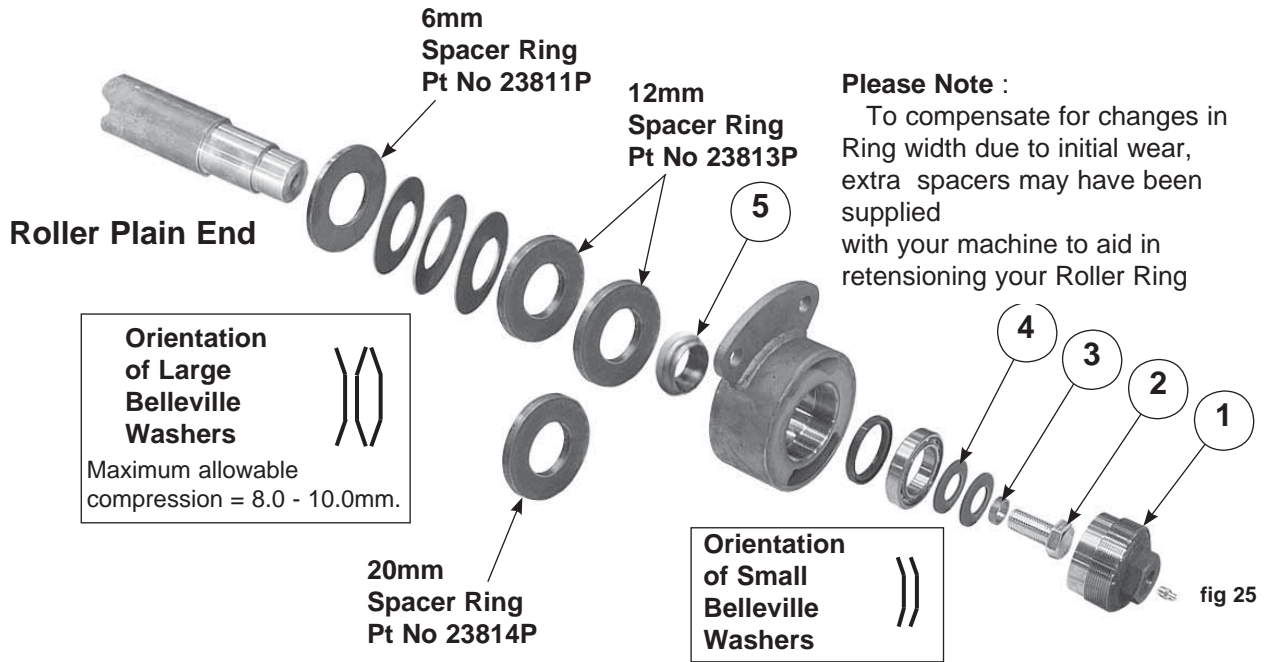
- 1 Visible gaps between the rings.
- 2 Spacers/Disc springs easily rotated on the shaft.
- 3 When fitted support chain forces rings apart and wedges between them.

Procedure for retensioning rings (Refer Fig 25 P27)

- 1 Support frame and machine on firm level surface, taking some weight off the rings.
- 2 Unbolt bearing mount from frame at the non-drive end.
- 3 Remove non-drive end (LH) endcap assembly fig 25/1.
- 4 Remove M24 set screw, fig 25/2, from end of shaft, complete with small spacer, fig 32/3, and small disc springs, fig 25/4.
- 5 Remove bearing mount and shaft spacer, fig 25/5.
- 6 Remove spacers, large disc springs, (note how these are arranged) and 6mm spacer ring.
- 7 At drive end (RH) check sprocket (on sprocket hub on plain roller) is hard against shaft shoulder and its grub screws are tight.
- 8 Check 6mm spacer is hard against sprocket on hub.
- 9 Work all rings towards drive end tensioning them equally each side and top and bottom.
- 10 The last ring (non-drive LH end) should overhang the 65 dia end of the shaft.
- 11 Replace 6mm spacer ring and large disc springs (check for cracks or breakages).
- 12 Build up spacer rings so the final spacer ring overhangs the shaft step by 8-10mm.
- 13 Replace shaft spacer and bearing mount, check oil seal for wear or damage.
- 14 Replace M24 set screw, small disc springs and spacer - ensure small disc springs sit over spacer and do not slip down between spacer and screw head.
- 15 Replace end cap assembly and regrease.
- 16 Rebolt bearing mount to frame.
- 17 Release tensioning mechanism from rings.

Consequence of not tensioning rings:-

- 1 Inconsistent drive/seeding.
- 2 Accelerated ring wear.
- 3 Excessive flexing of the shaft.
- 4 Damage to other machine components.
- 5 Possible breakage of shaft.



Maintenance Schedule (Refer also to Summary Chart P26)

1 Bolted Connections

All bolted connections on the machine should be checked after the first 30 hours of operation and retightened if necessary thereafter at regular intervals. (1000 hectares or annually whichever occurs first).

2 Gearbox

The oil level in the gearbox can be seen in the oil gauge window. Refer Fig 26/1. Changing the gearbox oil is normally not necessary. For refilling the oil remove the 1/2" BSP plug on the top face of the gearbox, hydraulic oil Castrol Hyspin AWH 32-68 should be used. The total filling capacity is 1 litre.

DO NOT OVERFILL.

3 Maintenance of the Clutch

The clutch is of the wrap spring type and is operated by a small hydraulic ram.

If the "V" ring seals get damaged or prolonged working in a very dusty environment has caused the clutch to stick or slip. It should be fully dismantled and thoroughly cleaned. Inspect "V" ring seals for wear or damage, if time allows soak in oil overnight before refitting. Check spring for cracks or damage especially to the "tang" that fits into the outer housing.

Thoroughly dry all components and reassemble carefully. **DO NOT USE ANY LUBRICANTS.**

4 Roller Chains

All drive chains should first be checked after 20 hours of operation and thereafter every 100 Ha of operation as follows:-
The metering wheels of the seed drill are driven via roller chains from the roller shaft.

The roller chain (Fig 27/1) and spring loaded tensioner (Fig 27/2) should still be checked periodically by removing the cover on the inside of the frame.

The other drive chains also have spring loaded tensioners, but should still be checked at regular intervals as previously mentioned. Refer P 25.

Removing the guard from the back of the gearbox gives access to the tensioner on the input drive.

The other tensioner on the output end of the gearbox is accessed by removing the cover on the outside of the drive pedestal.

Cleaning of the roller chains is recommended after long periods of operation. Remove the chain, wash in kerosene and then dip them in heated grease, oil or spray them with a suitable commercial roller chain lubricant.

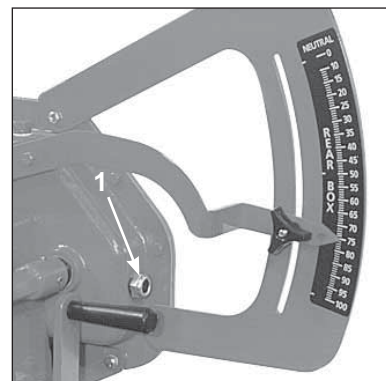


fig 26

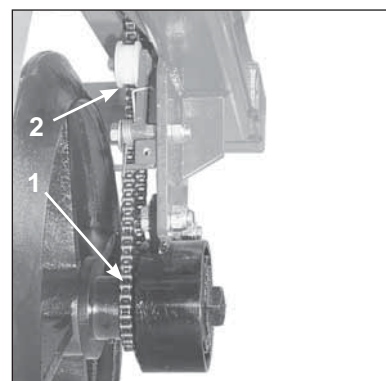


fig 27

5 Grease Nipples (Refer Lubrication Chart P25)

Grease at regular intervals (weekly or after 100Ha). Grease nipples and the grease gun should be carefully cleaned before use and dirty grease should be fully discharged from the bushes. Wipe off excess grease and dispose of safely.

6 Bottom Flaps

The required seed rate is controlled by both the metering wheels and the bottom flaps. The seed flows from the seed box into the metering wheel housings. Inside the metering wheel housing (Fig 28/1) the seed is caught between the metering wheel (Fig 28/2) and the bottom flap (Fig 28/3). The metered amount of seed is transported by the metering wheel to the edge of the bottom flap where it drops off into the seed guide tube which leads to the coulter. Varying grain sizes require the matching of the flap clearance to the different grain sizes. This matching is done by raising or lowering the bottom flaps by using the flap adjusting lever on the LH end of the seed box. If larger foreign particles, e.g. stones get between the metering wheel and the bottom flap, the bottom flap can give way downwards. A strong return spring (Fig 28/4) brings the bottom flap immediately back into the working position.

The metering system should be checked every 1/2 year or before any sowing period with an empty seed box and empty metering housings.

Use the following procedure:

Put the bottom flap setting lever (located on the LH end of the seed boxes) in position "1". Refer Fig 29.

By turning the metering wheel shaft by hand check the flaps are all set to a gap of 0.1 to 0.5mm (refer Fig 28).

To adjust individual flaps use the spring tensioning screw (Fig 36/5).

7 Tyre Pressure

The recommended tyre pressure is 3.1-4.2 bar (45-60psi). Check tyre pressure regularly to ensure correct pressure is maintained. Weekly checks are recommended.

Note: Re Maintenance Schedule (P26)

Where the frequency is given in terms of time of use (e.g. weekly) or area covered (e.g.100 Ha) perform the maintenance task based on whichever occurs first.

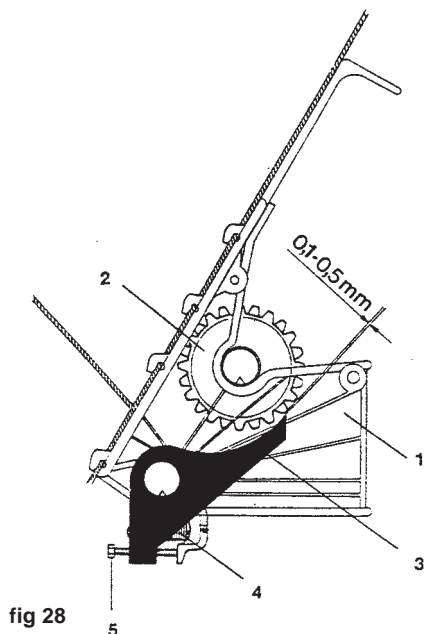


fig 28

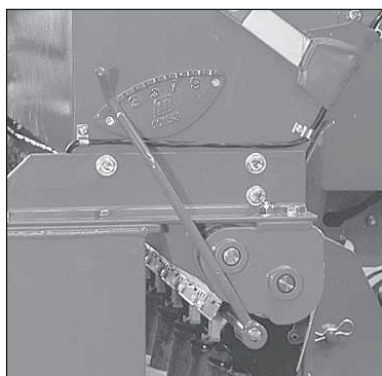


fig 29



Storage

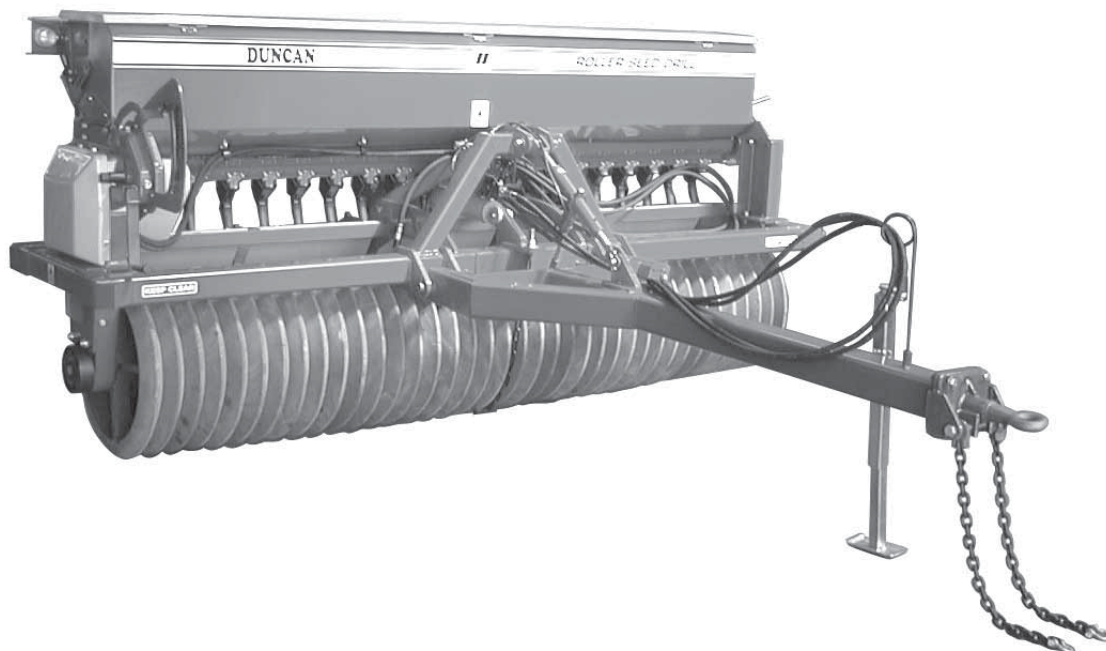
Preparing the Machine for Storage.

Locate a dry level surface. The machine should be stored wherever possible with the rams retracted. The drive chains should be lubricated with suitable roller chain lubricant before prolonged periods of storage.

Parts List



Roller Seed Drill



Built to work.

Head Office:
P.O. Box 2018
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Telephone (03) 688 2029
Facsimile (03) 688 2821

Australian Branch:
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Laverton North 3026
Melbourne, Australia
Telephone (03) 9314-9666
Facsimile (03) 9314-6810

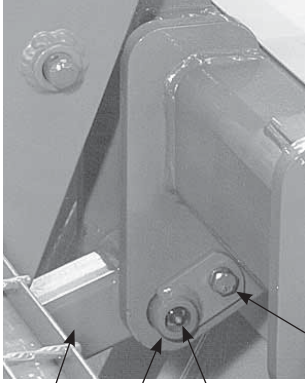
Roller Seed Drill Complete Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	Refer Page 34/35	Mainframe & Drawbar	1
2	Refer Page 43	Hydraulics	1
3	23853	Roller Ring Support Chain Assembly	1
4	Refer Page 38/39	Roller Assembly	1
5	24390	Drive Guard (Refer Also Page 48/49)	1
6	24135	Crank Arm & Handle Assembly	1
7	24087	Outside Guard (Refer Also Page 48/49)	1
8	Refer Page 44/45	Roller Drive	1
9	Refer Page 45	Drive Chains	1
10	Refer Page 46/47	Clutch Shaft Assembly	1
11	Refer Page 48/49	Gearbox Drive Pedestal	1
12	Refer Page 52/53	Clutch Assembly	1
13	24085	Inner Chain Guard Lower (Refer Also Page 48/49)	1
14	24148	Gearbox Final Assembly (Refer Also Page 54/55)	1
15	Refer Page 56/57	Seedbox Assembly	1
16	45143	M24 Nyloc Nut	1
17	45163	M24 H.D. Flat Washer	1
18	Refer Below	Ripstop Weather Skirt	1
19	Refer Below	Calibration Tray Assembly	2
20	43621	10.0 / 75 - 15.3 Wheel Assembly	2
21	28449	Wheel Hub Assembly (Refer Also Page 36/37)	2
22	Refer Page 60/61	Seeder Assembly	*N
23	23966	Chain Anchor Pin	1
24	45272	R-Clip S12	1
25	Refer Page 50/51	Box Shaft Assembly	1
26	Refer Page 59	Agitator Shaft Assembly	1
27	Refer Page 58	Agitator Drive	1
28	Refer P 40/41/42	Wiring & Lighting Kit (Optional)	1
29	24078	Lower Chain Guard (Front)	1
30	24082	Lower Chain Guard (Rear)	1
31	43906	Decal 'No Ride' (75x99)	2
32	43901	Decal 'Pinch Point/Moving Parts' (50x66)	5
33	43902	Decal 'Slippery When Wet' (100x45)	2
34	43909	Decal 'Keep Clear' (38x192)	2
35	43905	Decal Arrow (25x35)	2
36	43709	Decal Don't Use Wheel As Step (70x110)	2
37	43832	Coupling Safety Chain	2
38	28720	Safety Chain Sleeve	2
39	45086	M20 x 260 Class 8.8 Zinc Plated Bolt	1
40	45141	M20 Nyloc Nut	1
41	45001S	M10 x 20 Class 4.6 Zinc Plated Set Screw	2
42	45152	M10 Zinc Plated Light Flat Washer	2
43	45166	M10 Zinc Plated Spring Washer	2
44	43911	'30 km/hr'	2

Part numbers for different width machines			
Item	8' Drill	9' Drill	10' Drill
18	24217	24218	24219
19	24232	24235	24238
25	N=16	N=18	N=20

*N Where N = number of Seeder Assemblies fitted. e.g. 18 for 9'.0" Machine (see table below for part number).

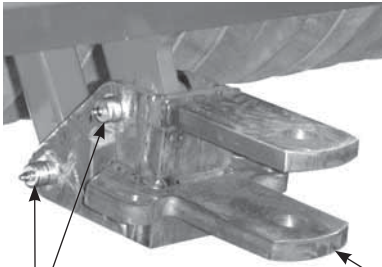
Rear Link Pivot



- 16
- 19
- 21

- 32
- 27
- 25
- 22
- 28

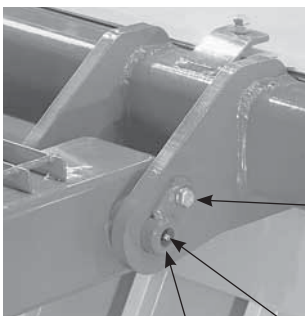
Rear Hitch



- 17
- 21
- 22
- 28

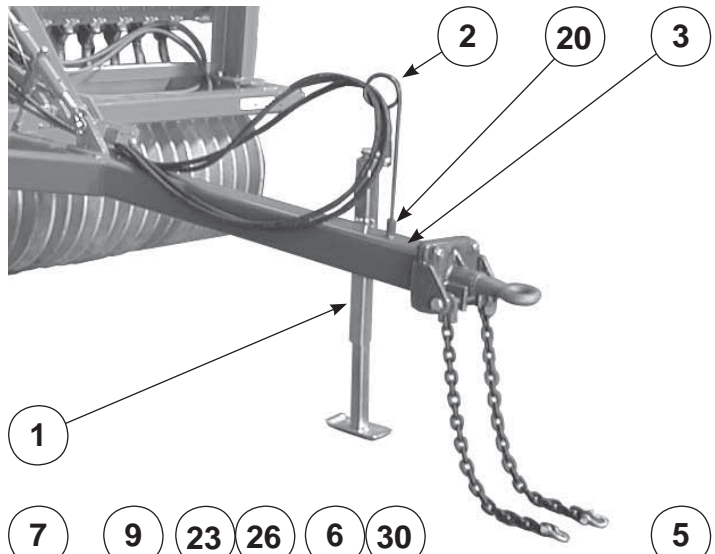
- 29
- 31
- 8
- 18

Wheel Frame Pivot



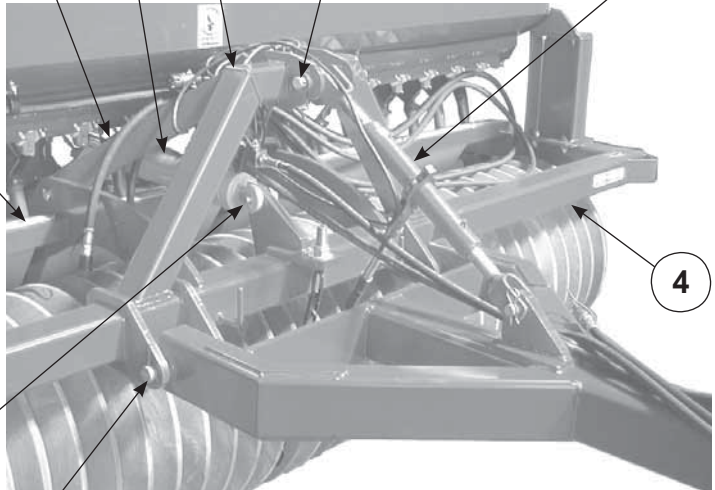
- 15
- 21

- 22
- 28

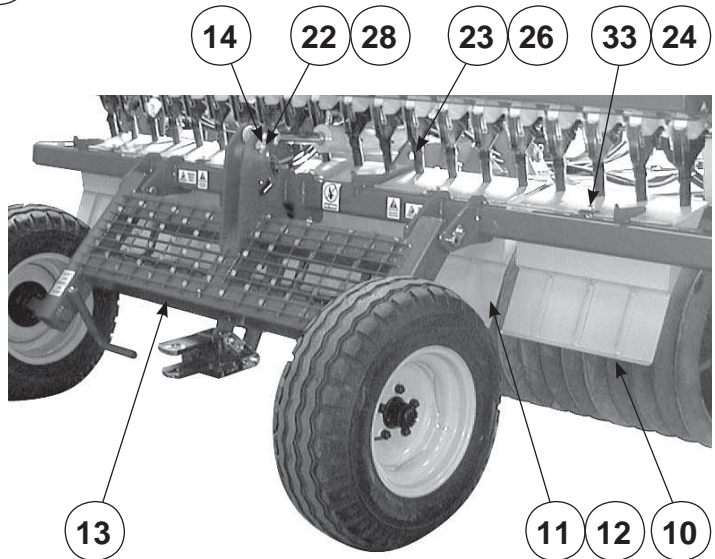


- 1
- 2
- 20
- 3

- 7
- 9
- 23
- 26
- 6
- 30



- 4
- 5



- 14
- 22
- 28
- 23
- 26
- 33
- 24

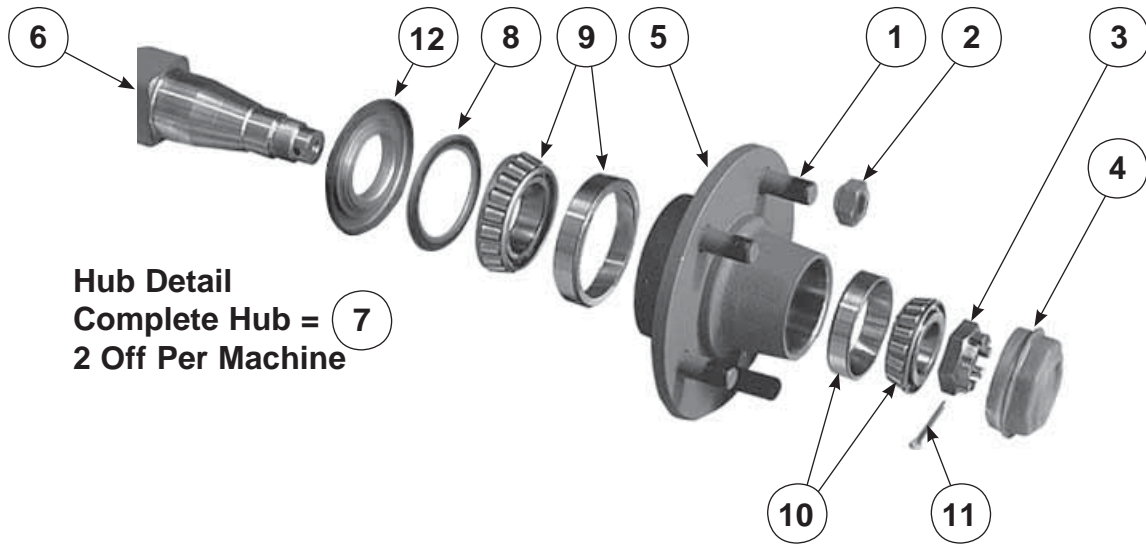
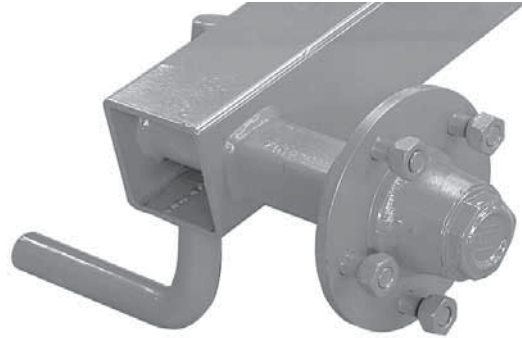
- 13
- 11
- 12
- 10

Roller Seed Drill Mainframe & Drawbar

ITEM	PART No.	DESCRIPTION	QTY
1	31478	2500 kg Jack and Stub Assembly	1
2	4800315	Hose Support	1
3*	23870	Drawbar Assembly Standard	1
4	Refer below	Chassis Assembly	1
5	43395	H.D. Ratchet Ram Turnbuckle	1
6	23957	Turnbuckle Top Pin	1
7	23961	Rear Stay	2
8	23951	Drawbar Pivot Pin	2
9	43628	Double Acting Ram 3.5" x 305 x 3/4"-16 SAE	1
10	Refer below	Outer Seed Chute Set	2
11	Refer below	Inner Seed Chute Set	2
12	24177	4 Run Centre Seed Chute Set	1
13	24023	Wheel Frame Assembly	1
14	22262	Ram Pin Assembly	1
15	23955	Pivot Pin Assembly (35.0 mm Dia)	2
16	23985	Hitch Pivot Arm Assembly	1
17	31124	Pivot Pin Assembly	2
18	23991	Hitch Assembly	1
19	23965	Pivot Pin Assembly (30.0 mm Dia)	1
20	45180	M8 x 10 Socket Head Grub Screw	1
21	43118	M8 x 1.25 Pitch Grease Nipple (Straight)	5
22	45001S	M10 x 20 Class 8.8 Z/P Setscrew	6
23	45040	M16 x 50 Class 8.8 Z/P Bolt	4
24	45130	M10 Hexagon Nut Z/P	5
25	45137	M8 Nyloc Nut	10
26	45140	M16 Nyloc Nut	4
27	45151	M8 Light Flat Washer	10
28	45166	M10 Spring Washer Z/P	6
29	45272	R-Clip (S12)	2
30	45276	6.0 mm Dia x 40.0 mm Roll Pin	2
31	45277	6.0 mm Dia x 50.0 mm Roll Pin	4
32	45411S	M8 x 20 Class 4.6 Z/P Setscrew	10
33	45419S	M10 x 30 Class 4.6 Z/P Setscrew	5

Part numbers for different width machines			
Item	8' Drill	9' Drill	10' Drill
4	23945	23946	23947
10	24158	24158	24167
11	24158	24167	24167

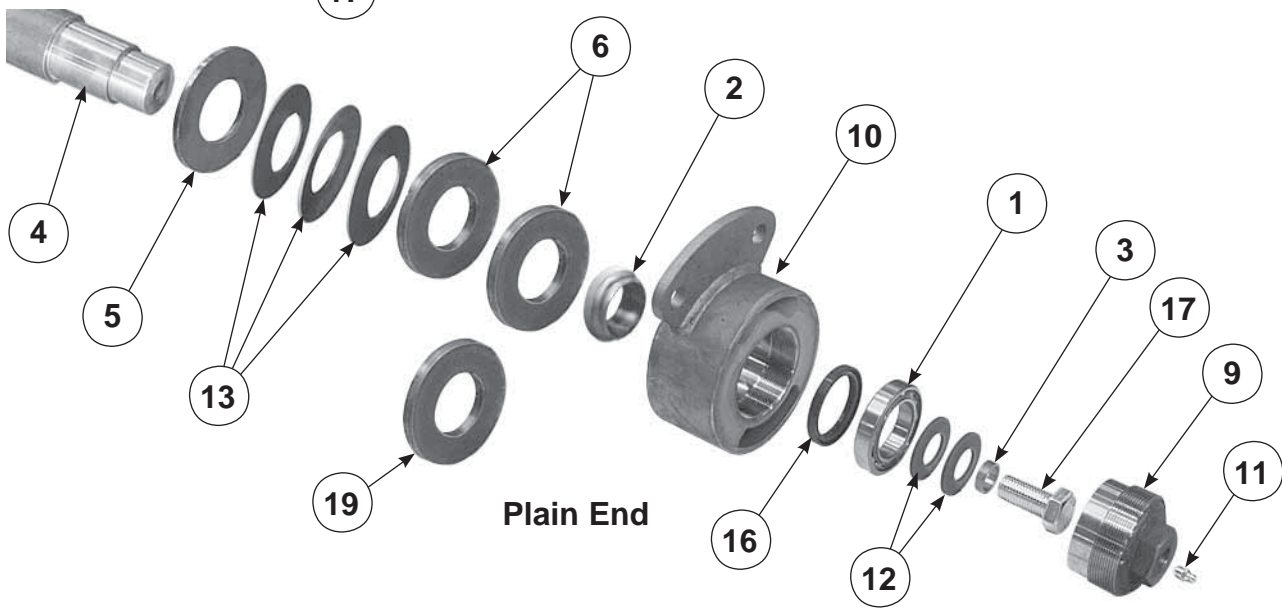
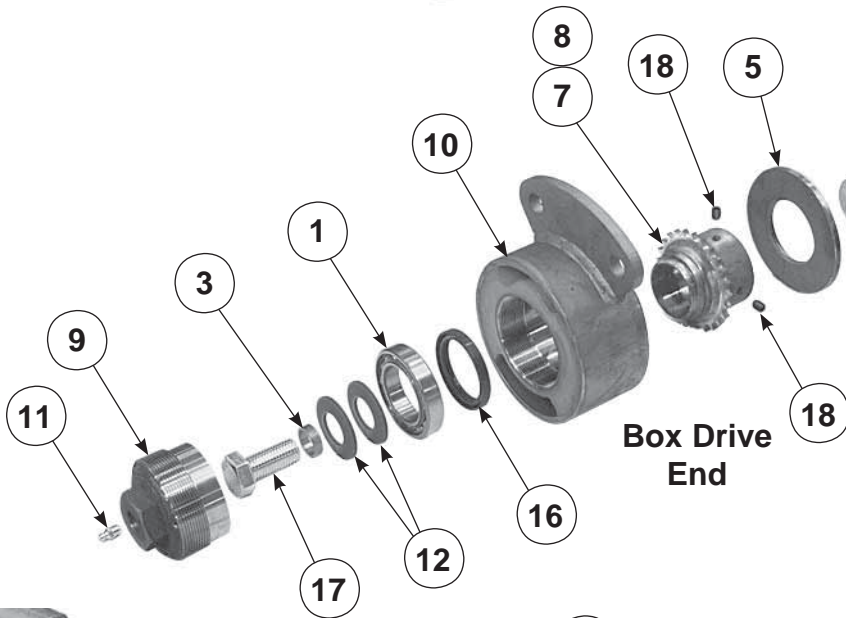
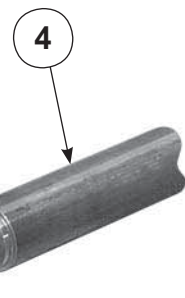
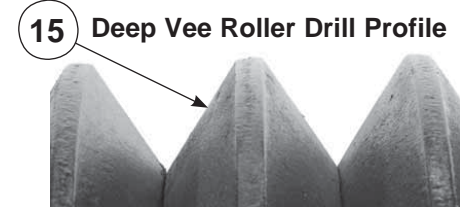
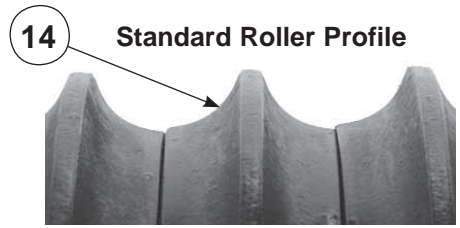
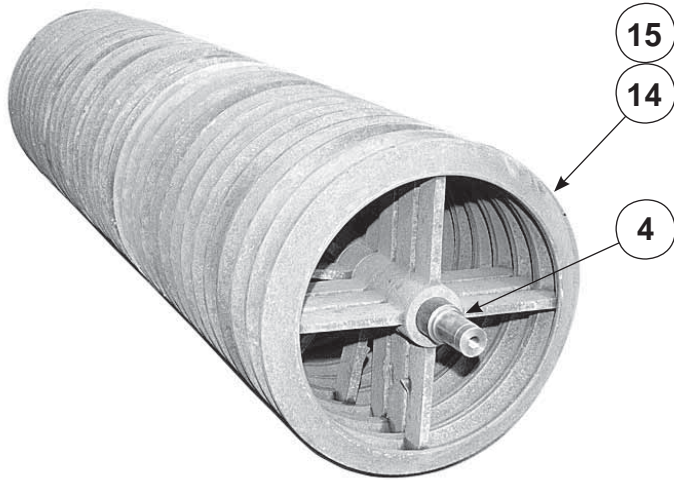
*3. Alternative Drawbar
Part No 23869 Drawbar Assembly Short.



Hub Detail
Complete Hub = 7
2 Off Per Machine

Roller Seed Drill Wheel Hub Assemblies

ITEM	PART No.	DESCRIPTION	QTY
1	43596	A.D.R. M16 -1.5P x 45 Hub Stud	5
2	43597	A.D.R. M16 - 1.5P Wheel Nut	5
3	43598	A.D.R. M27 - 1.5P Castle Nut	1
4	43599	A.D.R. 62mm Hub Cap	1
5	43600	A.D.R. Hub	1
6	24017	Wheel Stub Axle	1
7	28449	A.D.R. Hub Set (As Shown)	1
8	43603	Outer Lip Oil Seal	1
9	43421	30209 J2 Inner Bearing	1
10	10282	30206 J2 Outer Bearing	1
11	45303	3.5 Diameter x 40 Long Cotter Pin	2
12		Trash Shield	1



Roller Seed Drill Roller Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	17420	6011-2RS1 Bearing (Inside Seal Removed)	2
2	23802	Shaft Spacer (Non-drive End)	1
3	23806	Spacer	2
4	Refer Below	75 Diameter Shaft	1
5	23811P	6mm Ring Spacer	3
6	23813P	12mm Ring Spacer	3
7	23816	Sprocket Hub (minus sprocket) Roller Only	1
8	23817	25 Tooth 1/2" Pitch Sprocket Assembly Roller Drill	1
9	23824	Endcap Assembly	2
10	23834	Flexible Bearing Mount	2
11	43118	M8 x 1.25 Pitch Straight Grease Nipple	2
12	43623	63 x 31 x 3.5 Disc Spring	4
13	43624	125 x 64 x 3.5 Disc Spring	3
14	Refer Below	3" x 26" Standard Roller Ring (Roller Only)	-
15	Refer Below	3" x 26" Deep Vee Roller Ring (Roller Drill)	-
16	43629	(TC 62 80 08) Oil Seal	2
17	45100	M24 x 50 Class 8.8 Zinc Plated Bolt	2
18	45186	M10 x 12 Socket Head Grubscrew	2
19	23814P	20mm Ring Spacer	1

Please Note :

To compensate for changes in Ring width due to wear, extra spacers may have been supplied with your machine to aid in retensioning your Roller Ring assembly as required.

Part numbers and quantities for different machines						
Item	8' Roller	Quantity	9' Roller	Quantity	10' Roller	Quantity
4	23807	1	23808	1	23809	1
14	43625	30	43625	34	43625	38
15	43626	30	43626	34	43626	38

NOTES: BOTH LIGHTS VIEWED FROM LENS SIDE

MARKER LIGHT FITTING OUTLINE
(VIEWED FROM LENS SIDE)
PART No 43436

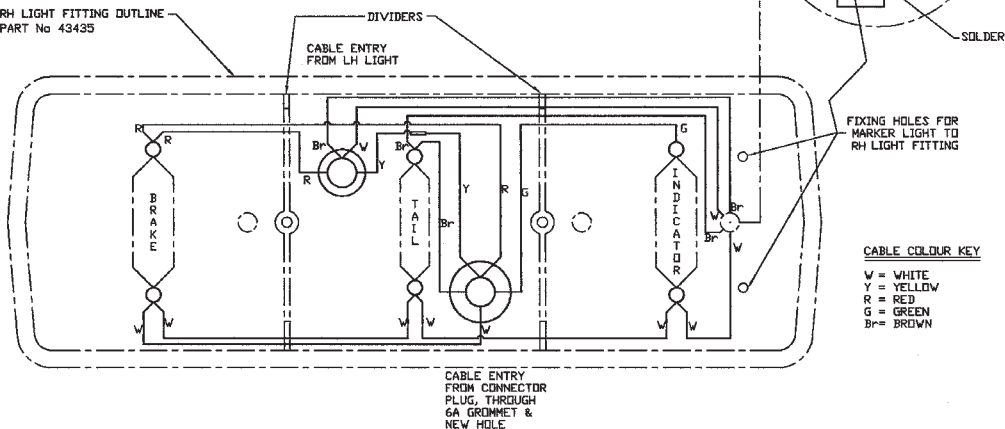
RH LIGHT FITTING OUTLINE
PART No 43435

PASSAGE OF WIRES THROUGH
LIGHT FITTINGS BACK PLATES
& LAMP MOUNTING BRACKET.

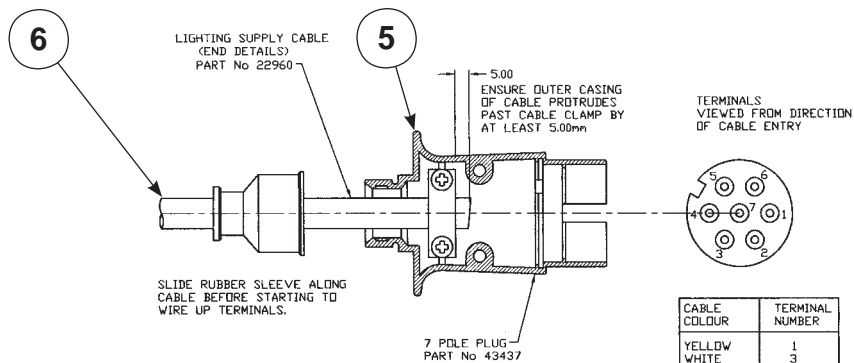
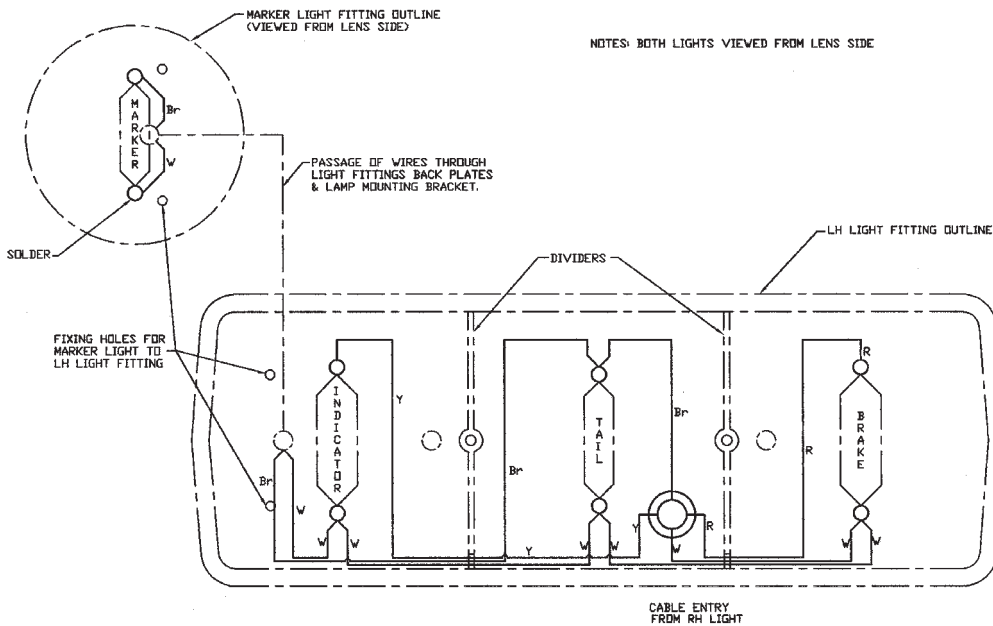
FIXING HOLES FOR
MARKER LIGHT TO
RH LIGHT FITTING

CABLE COLOUR KEY

W = WHITE
Y = YELLOW
R = RED
G = GREEN
Br = BROWN



NOTES: BOTH LIGHTS VIEWED FROM LENS SIDE

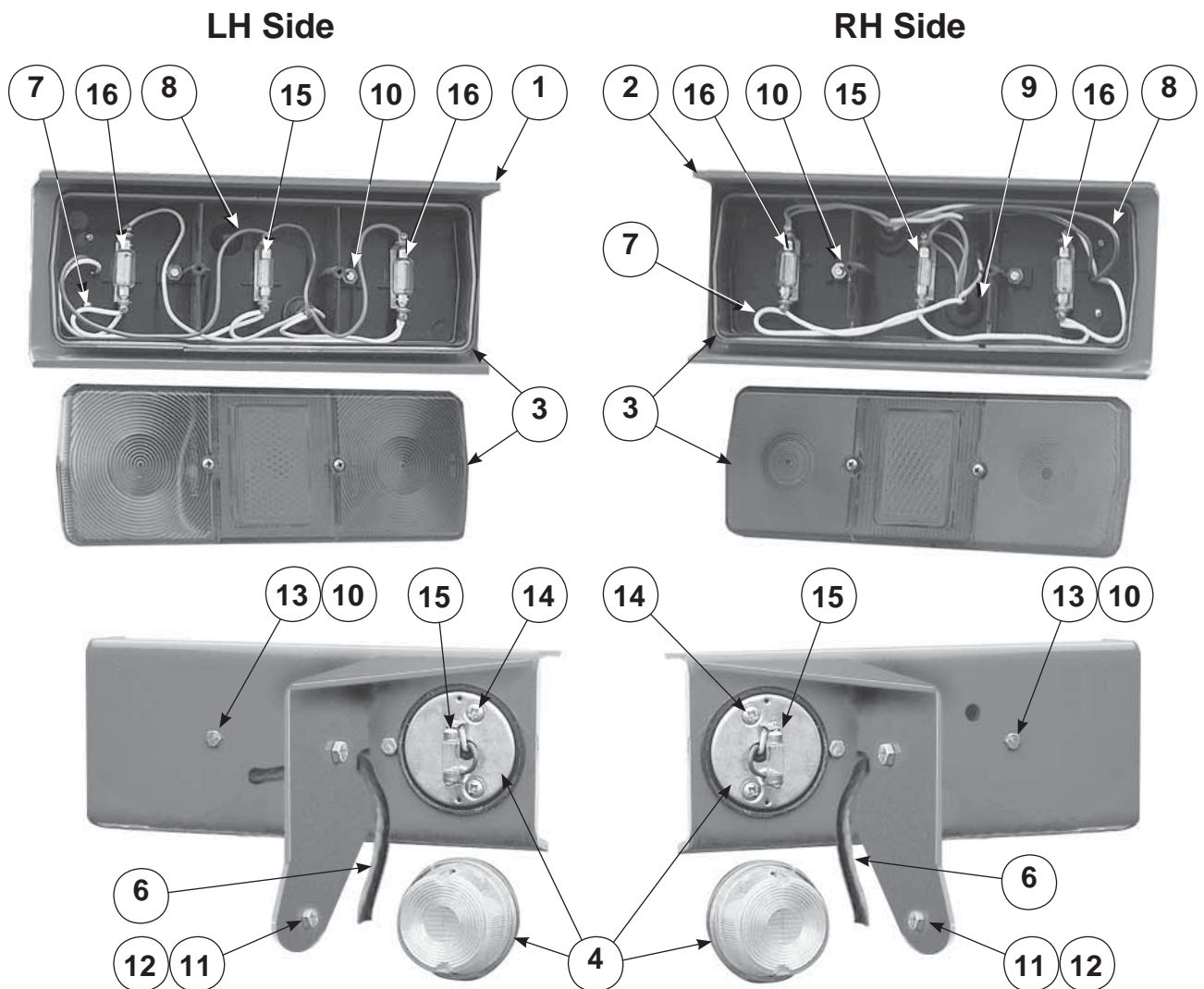


CABLE COLOUR	TERMINAL NUMBER
YELLOW	1
WHITE	3
GREEN	4
RED	6
BROWN	7

NOTE: TERMINAL Nos 2 & 5 NOT USED

Roller Seed Drill Standard Wiring & Lighting Kit

ITEM	PART No.	DESCRIPTION	QTY
1	24228	Lamp Bracket Assembly L.H.	1
2	24227	Lamp Bracket Assembly R.H.	1
3	43435	Combination Rear Lamp	2
4	43436	Marker Lamp	2
5	43437	Trailer Round Connector Plug	1
6	43438	5 Core Trailer Flex (15 to 21 Run x 12m, 23/25 Run x 13m)	1
7	43443	White 1mm Appliance Wire x 1m	1
8	43444	Brown 1mm Appliance Wire x 1m	1
9	43448	No. 6 Rubber Grommet	1
10	45122	M6 Class 8.8 Zinc Plated Hex Nut	1
11	45137	M8 Nylock Nut	4
12	45399	M8 x 30 Class 4.6 Zinc Plated Bolt	4
13	45401S	M6 x 16 Class 4.6 Zinc Plated Set Screw	4
14	45860	No. 12 x 3/4" Pan PZ Zinc Plated Self Tapping Screw	4
15		5W Festoon Bulb 15 x 44mm	4



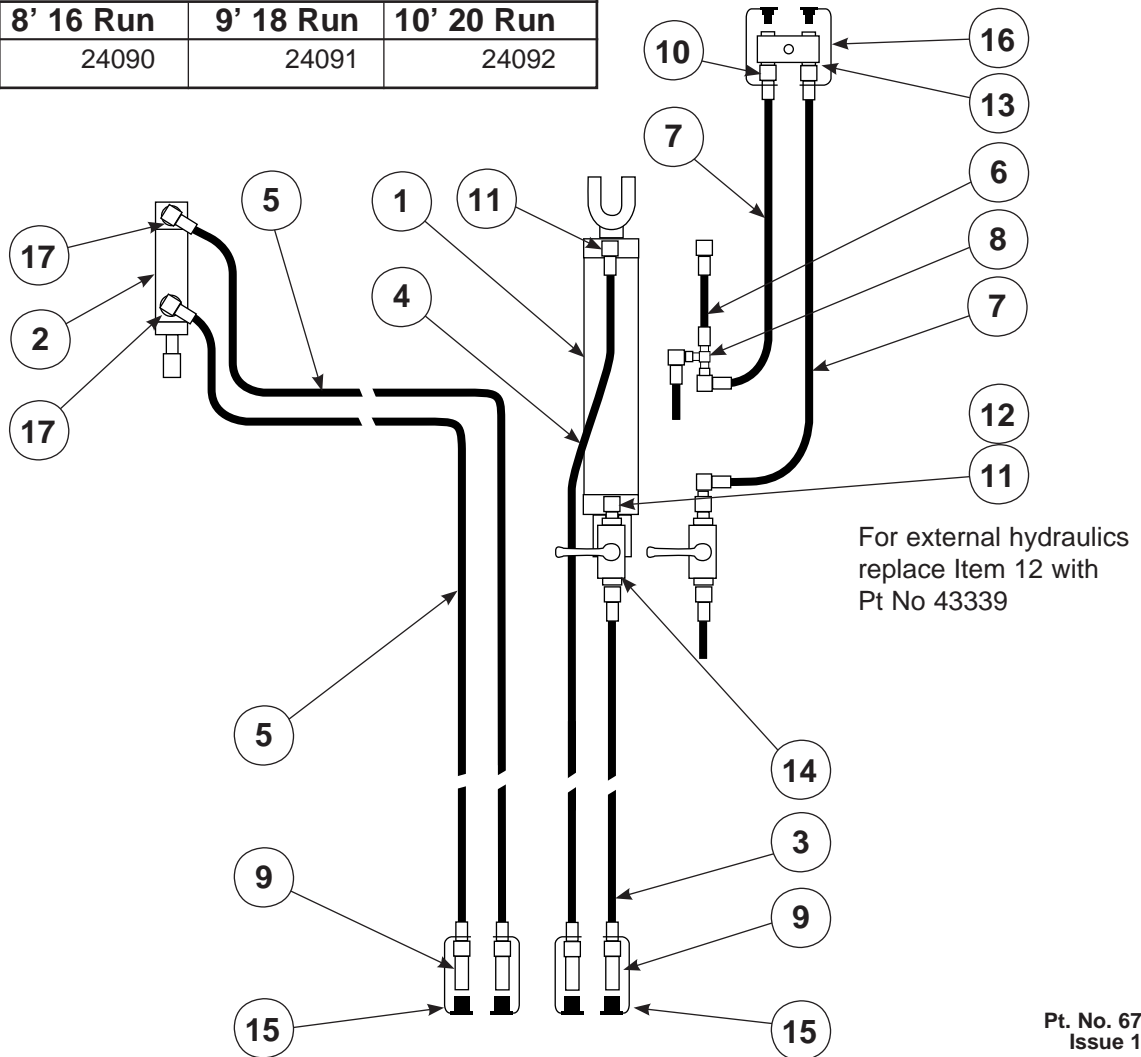
Plain Roller Optional Wiring & Lighting Kit Pt No 24032K

ITEM	PART No.	DESCRIPTION	QTY
1	22346	Lamp Bracket Assembly L.H.	1
2	22347	Lamp Bracket Assembly R.H.	1
3	43435	Combination Rear Lamp	2
4	43436	Marker Lamp	2
5	43437	Trailer Round Connector Plug	1
6	43438	5 Core Trailer Flex	11m
7	43443	White 1mm Appliance Wire x 1m	1
8	43444	Brown 1mm Appliance Wire x 1m	1
9	43448	No. 6 Rubber Grommet	1
10	45122	M6 Class 8.8 Zinc Plated Hex Nut	4
11	45137	M8 Nylock Nut	4
12	45395	M8 x 70 Zinc Plated Bolt	4
13	45401S	M6 x 16 Class 4.6 Zinc Plated Set Screw	4
14	45860	No. 12 x 3/4" Pan PZ Zinc Plated Self Tapping Screw	4
15		5W Festoon Bulb 15 x 44mm (Spares Only)	4
16		21W Festoon Bulb 15 x 44mm (Spares Only)	4
17	24033	Light Mount Stand Welded Assembly	2
18	28562	Tine Mount Clamp Plate	2
19	45157	M8 Zinc Plated Heavy Duty Flat Washer	4
20	43333	Cable Tie	15
21	45035	M12 x 140 Class 8.8 Zinc Plated Bolt	4
22	45139	M12 Nyloc Nut	4
23	43818	Plastic Cap	2

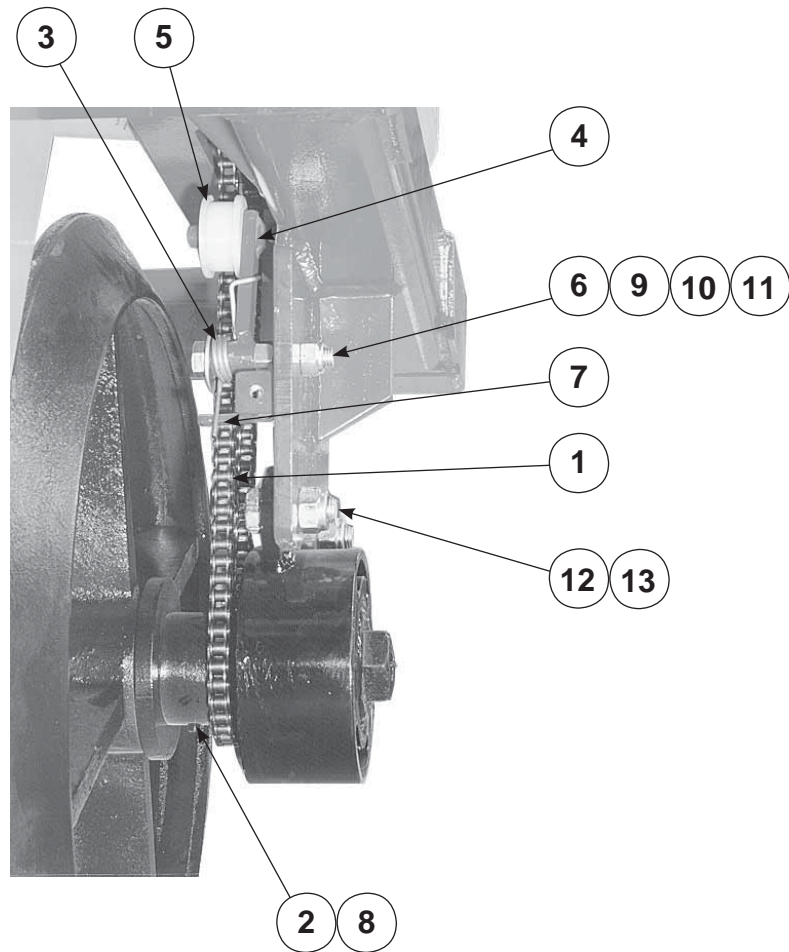
Roller Seed Drill Hydraulics

ITEM	PART No.	DESCRIPTION	QTY
1	43628	Double Acting Ram 3.5" x 305 x 3/4"-16 SAE	1
2	43627	Double Acting Ram 1.5" x 25 x 1/4" BSP (Clutch Actuator)	1
3	24088	Hydraulic Hose 3.7m (Main Ram Rear)	1
4	24089	Hydraulic Hose 4.15m (Main Ram Front)	1
5	Refer Below	Hydraulic Hose (Clutch)	2
6	24095	Hydraulic Hose 0.21m (Main Ram Front Extension)	1
7	24096	Hydraulic Hose 0.67m (Main Ram to Rear Connector)	2
8	43077	3/8" BSP Hydraulic Tee	1
9	43147	1/2" BSP Male Quick Release Coupling	4
10	43148	1/2" BSP Female Quick Release Coupling	2
11	43280	3/4" UN'O' to 3/8" BSPP Nipple	2
12	43338	3/8" BSPT Male to 3/8" BSP Female Connector	1
13	28730	38 Diameter Double Tube Clamp	1
14	43393	3/8" BSP Ball Valve	1
15	43617	1/2" Male Probe Dust Cover	4
16	43618	1/2" Female Carrier Dust Plug	2
17	43999	1/4" BSP x 3/8" BSP 90 Deg Compact	2

Part numbers for different width machines			
Item	8' 16 Run	9' 18 Run	10' 20 Run
5	24090	24091	24092

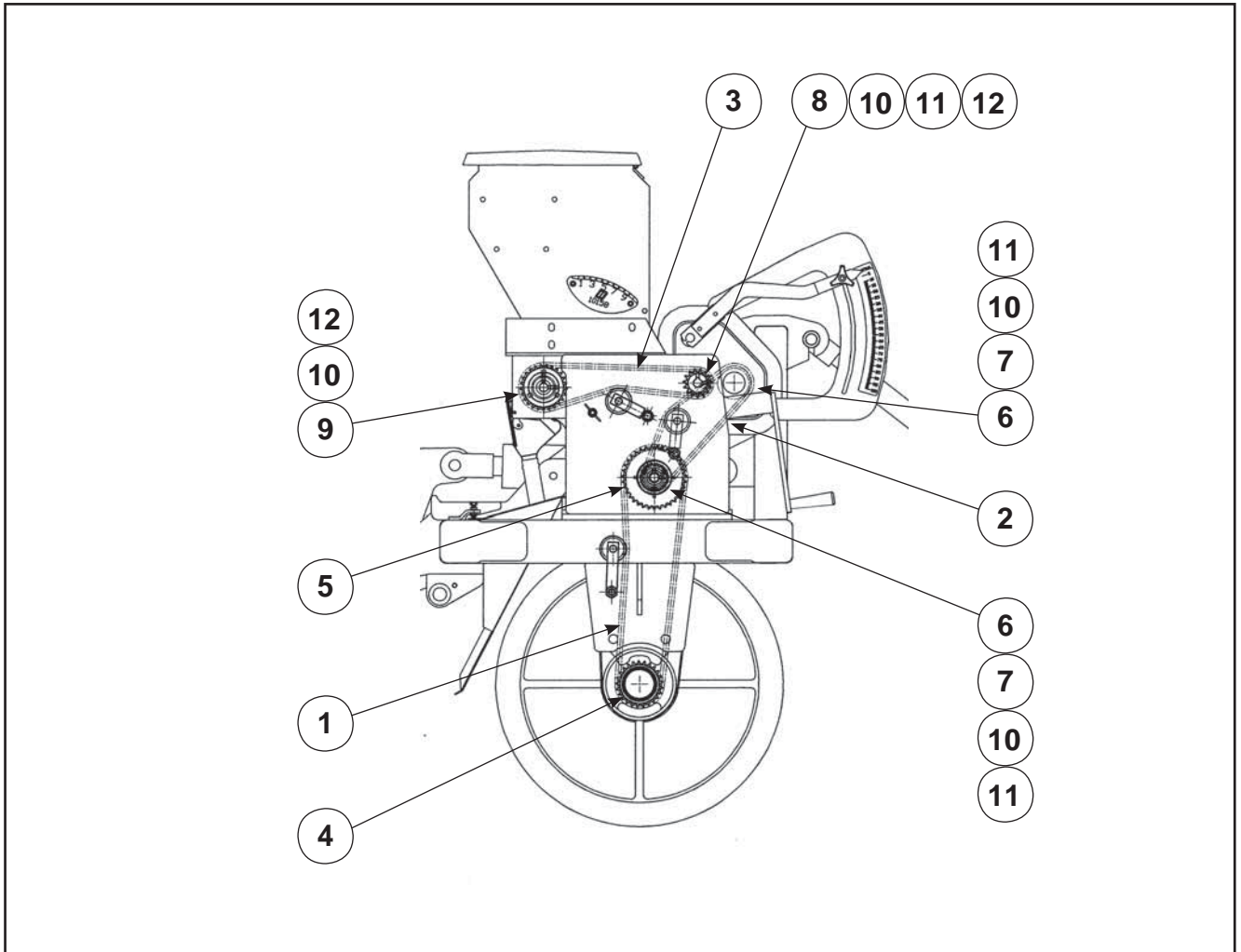


Roller Seed Drill Roller Drive Chain & Mounting

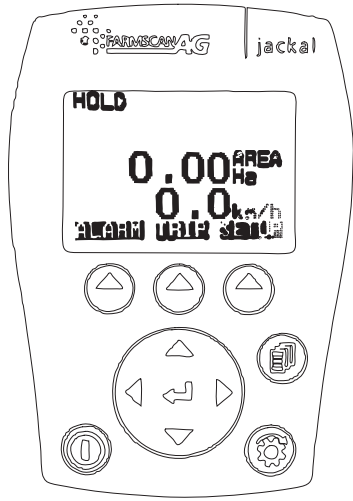


ITEM	PART No.	DESCRIPTION	QTY
1	24102	1/2" x 105 Link BS Chain (Roller Shaft to Clutch)	1
2	23817	25 Tooth 1/2" Pitch Sprocket Assembly (Roller Shaft)	1
3	22523	RH Torsion Spring	1
4	23370	Chain Tensioner Arm Assembly	1
5	22535	Chain Tension Roller	1
6	24100	Lower Chain Tensioner Bolt	1
7	24106	Chain Tensioner Anchor 50 Ext	1
8	45186	M10 x 12 Socket Head Grubscrew	2
9	45140	M16 Nylock Nut	1
10	45160	M16 Heavy Duty Zinc Plated Flat Washer	1
11	45132	M16 Class 8.8 Zinc Plated Hex Nut	1
12	45141	M20 Nylock Nut (2 Each Bearing Housing)	4
13	45062	M20 x 50 Class 8.8 Z/P Bolt (2 Each Bearing Housing)	4

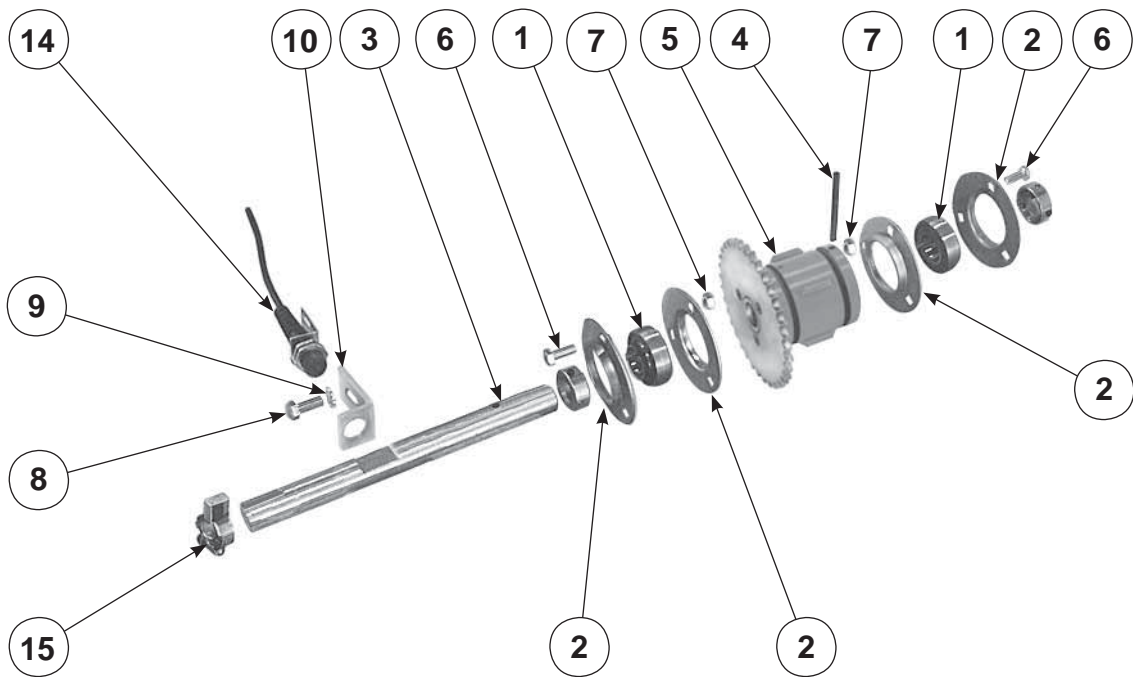
Roller Seed Drill Drive Chains



ITEM	PART No.	DESCRIPTION	QTY
1	24102	1/2" x 105 Link BS Chain (Roller Shaft to Clutch)	1
2	23384	1/2" x 65 Link BS Chain (Clutch to Gearbox Input)	1
3	24105	1/2" x 75 Link BS Chain (Gearbox to Seed Box)	1
4	23817	25 Tooth 1/2" Pitch Sprocket Assembly (Roller Shaft)	1
5	24112	35 Tooth Clutch Final Assembly Refer P 52/53	1
6	25982	15/19T Tooth x 1/2" Pitch Change Sprocket	2
7	45180	M8 x 10 Socket Head Grubscrew	3
8	22044	15 Tooth x 1/2" Pitch 20mm Bore Sprocket	1
9	22537	25 Tooth x 1/2" Pitch 20mm Bore Sprocket	1
10	22294	6 x 6 x 25 Sprocket Key	5
11	45179	M8 x 8 Socket Head Grubscrew	4
12	45181	M8 x 12 Socket Head Grubscrew	3

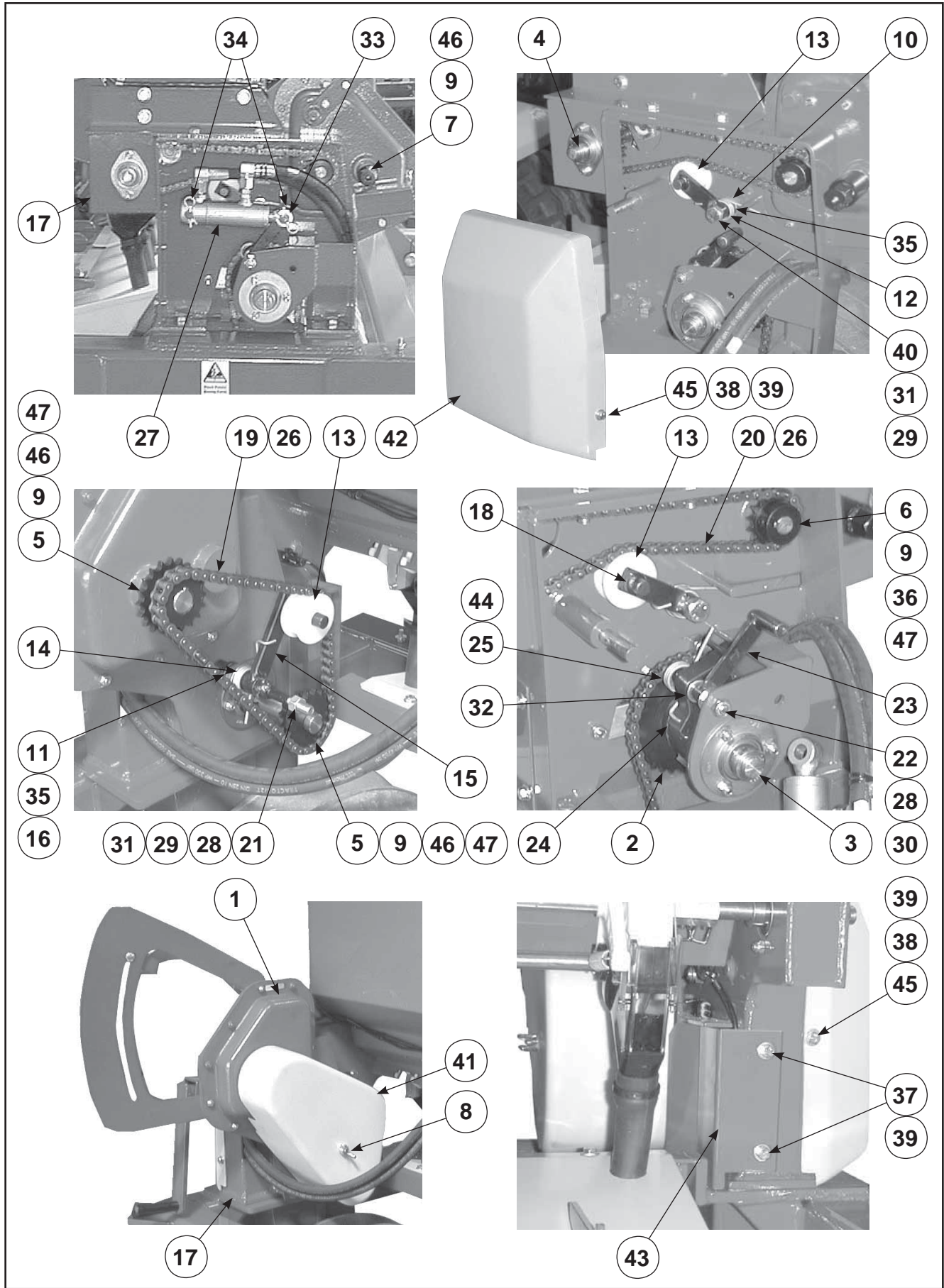


11 Jackal v3 kit



Roller Seed Drill Clutch Shaft Assembly

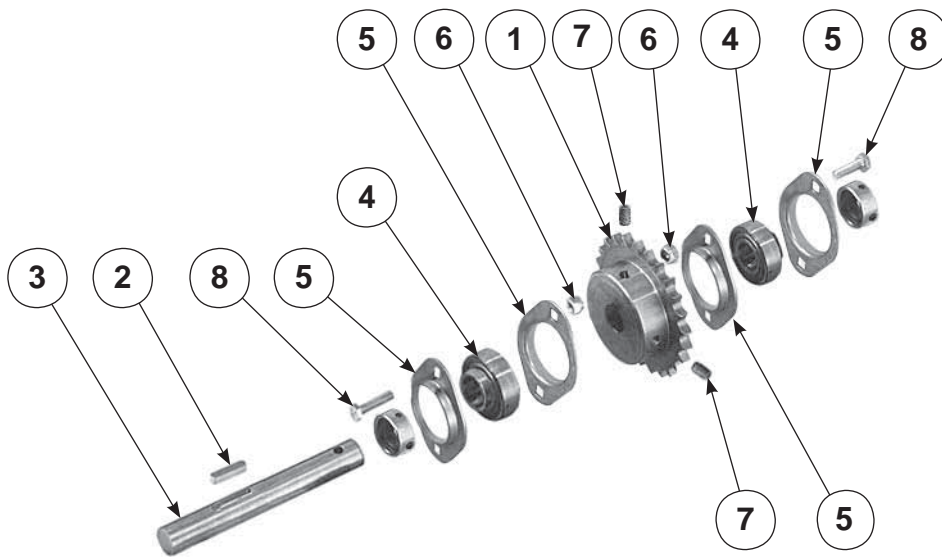
ITEM	PART No.	DESCRIPTION	QTY
1	43386	"Y" Bearing YET205 (25mm)	2
2	30359	Pressed Steel 3 Bolt Bearing Housing PF52 (2 Flanges)	2
3	24109	Roller Drill Clutch Shaft (25mm)	1
4	45280	6mm Roll Pin x 60 long	1
5	24112	35t Clutch Final Assembly	1
6	45412S	M8 x 25 Class 4.6 Zinc Plated Set Screw	6
7	45137	M8 Nylock Nut	6
8	45417S	M10 x 20 Class 4.6 Zinc Plated Set Screw	1
9	45166	M10 Zinc Plated Spring Washer	1
10	24128	Hectaremeter Sensor Mounting Bracket	1
11	44571K	Jackal v3 Hectaremeter Kit. Contains items 12 - 19	-
12	44572	Jackal v3 Speed & Area Meter	1
13	44573	Owner's Manual Jackal v3	1
14	43403	Hectaremeter Sensor w/o Nuts AA-110P/5	1
15	43404	Hectaremeter Clamp & Magnet AA-117	1
16	43154	Hectaremeter Sensor Brass Nut	2
17	44028	Window Mount AH-407	1
18	44031	7.5m Cable (2 way) AC-088	1
19	44574	Power Cable Assy Jackal v3 (complete: comprises items 19-22 below)	1
20	44029	Power Cable AC-105	1
21	44575	Cable S/Assy Jackal v3 (short 2way)	1
22	44146	11 way Terminal Block P321 Green	1



Roller Seed Drill Gearbox Drive Pedestal

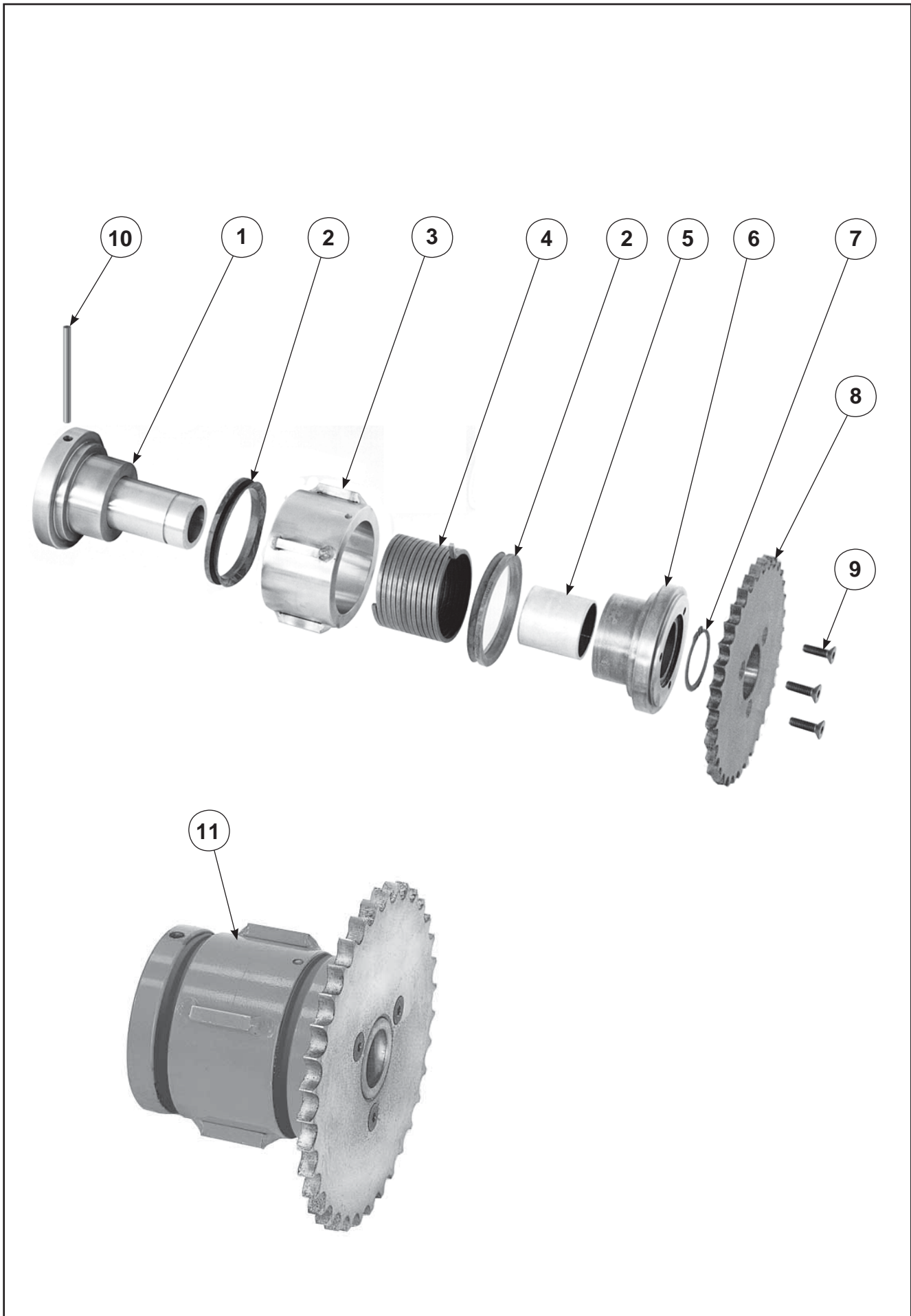
ITEM	PART No.	DESCRIPTION	QTY
1	24146	Roller Gearbox Final Assembly Refer Page 54-55	1
2	24112	35T Clutch Final Assembly Refer Page 52-53	1
3	Refer P 46/47	Clutch Shaft & Bearing Assembly	1
4	Refer P 50/51	Box Shaft & Bearing Assembly	1
5	25982	15T/19T 1/2" Pitch Change Sprocket	2
6	22044	15 Tooth x 1/2" Pitch 20mm Bore Sprocket	1
7	22050	Crank Adapter Assembly	1
8	45342	M12 Zinc Plated Wing Nut	1
9	22294	6 x 6 x 25 Sprocket Key	4
10	22474	6mm Chain Tensioner Spacer	1
11	22475	20mm Chain Tensioner Spacer	1
12	24127	Torsion Spring RH (Short)	1
13	22535	Chain Tension Roller	2
14	22523	Torsion Spring RH	1
15	25984	Chain Tensioner Assembly	1
16	23376	Chain Tensioner Anchor 30 Extension	1
17	24070	RH Drive End Seedbox Pedestal	1
18	24098	Short RH Chain Tensioner Assembly	1
19	23384	1/2" Pitch x 65 Link BS Chain	1
20	24105	1/2" Pitch x 75 Link BS Chain	1
21	24391	Tensioner/Guard Combi Bolt Assembly	1
22	24108	Clutch Actuating Arm Support Bolt	1
23	24120	Clutch Actuating Arm Assembly	1
24	24125	Clutch Stop Block Assembly	1
25	22522	LH Torsion Spring	1
26	43388	1/2" Pitch Joiner Link	2
27	43627	Double Acting Ram 1.5" x 25 x 1/4" BSP (Clutch Actuator)	1
28	45131	M12 Class 8.8 Zinc Plated Hex Nut	2
29	45132	M16 Class 8.8 Zinc Plated Hex Nut	2
30	45139	M12 Nylock Nut	1
31	45140	M16 Nylock Nut	2
32	45153	M12 Zinc Plated Light Flat Washer	2
33	45154	M16 Zinc Plated Light Flat Washer	1
34	45271	R Clip S10 or AG6	2
35	45160	M16 Heavy Duty Zinc Plated Flat Washer	2
36	45181	M8 x 12 Socket Head Grubscrew	1
37	45400S	M8 x 12 Class 4.6 Zinc Plated Set Screw	2
38	45151	M8 Zinc Plated Light Flat Washer	2
39	45165	M8 Zinc Plated Spring Washer	4
40	45465	M16 x 75 Class 4.6 Zinc Plated Bolt	1
41	24390	Guard For Roller Drill Quick Change	1
42	24087	Outer Drive Guard	1
43	24085	Inner Chain Guard Lower	1
44	45159	M12 Heavy Duty Zinc Plated Flat Washer	1
45	45411S	M8 x 20 Class 4.6 Zinc Plated Set Screw	2
46	45179	M8 x 8 Socket Head Grubscrew	4
47	45180	M8 x 10 Socket Head Grubscrew	3

Box Shaft Assembly



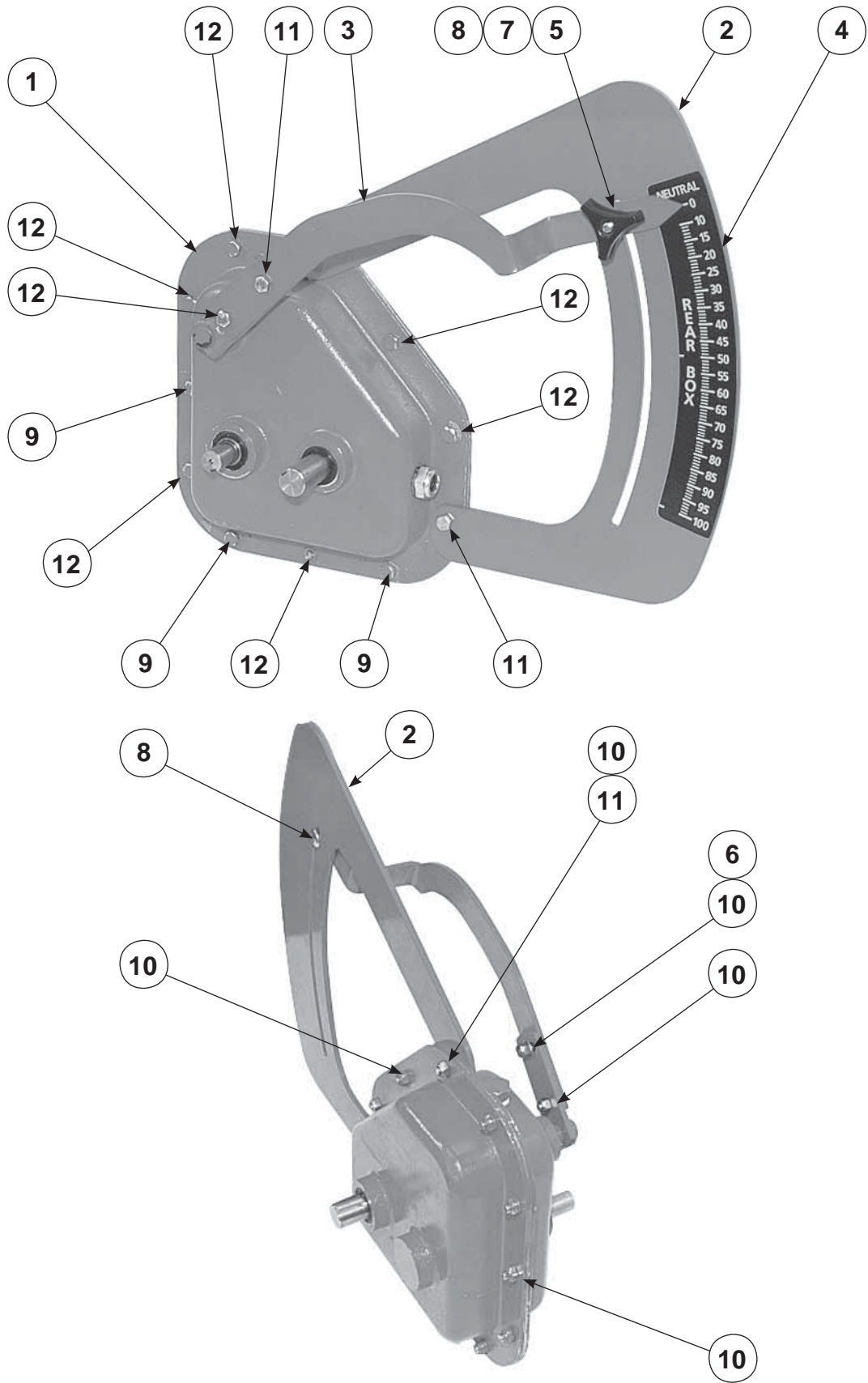
Roller Seed Drill Box Shaft Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	22537	25T x 1/2" Pitch Sprocket 20mm Bore	1
2	22294	6 x 6 x 25 Sprocket Key	1
3	24210	Box Lay Shaft	1
4	43385	"Y" Bearing YET 204 (20mm)	2
5	43387	Pressed Steel 2 Bolt Bearing Housing PFT47 (2 Flanges)	2
6	45137	M8 Nylock Nut	4
7	45181	M8 x 12 Socket Head Grubscrew	2
8	45412S	M8 x 25 Class 4.6 Zinc Plated Set Screw	4



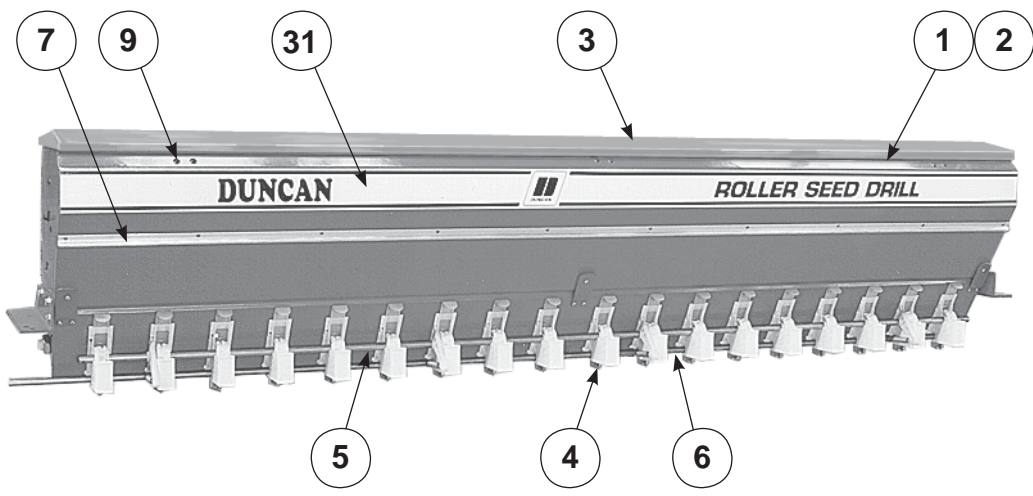
Roller Seed Drill Clutch Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	22151	Clutch Output Hub Assembly	1
2	43353	Vee Ring Seal V-65A (Forsheda)	2
3	22149	Clutch Sleeve Assembly	1
4	22152	Clutch Spring (R.H.)	1
5	43357	Glycodur Bush (35mm Bore)	1
6	22145	Clutch Input Hub	1
7	43358	A35 Seeger Tru-Arc Circlip	1
8	24111	35T Input Sprocket	1
9	47022	M6 x 20 Socket Head Countersunk Screw	3
10	45280	6mm Roll Pin x 60 long	1
11	24112	35T Clutch Assembly Complete	1

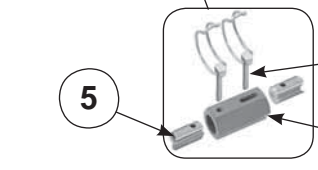
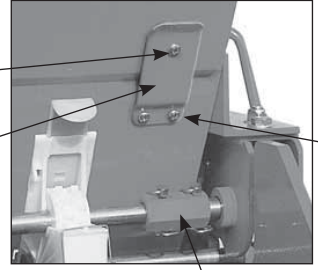


Roller Drill Gearbox Final Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	24145	Gearbox Sub-Assembly (see Page 18)	1
2	23616	Eclipse Gearbox Quadrant	1
3	23615	Eclipse Gearbox Speed Adjustment Lever	1
4	22042	Speed Indicator Label Rear	1
5	43366	Tri-Knob with M8 Tapped Centre	2
6	45151	M8 Zinc Plated Light Flat Washer	1
7	45157	M8 Heavy Duty Zinc Plated Flat Washer	1
8	47031	M8 x 40 Cup Head Class 4.6 Zinc Plated Bolt	1
9	44963	M8 x 35 Class 8.8 Zinc Plated Bolt	3
10	45137	M8 Nylock Nut	13
11	45412S	M8 x 25 Class 4.6 Zinc Plated Set Screw	3
12	45411S	M8 x 20 Class 4.6 Zinc Plated Set Screw	7

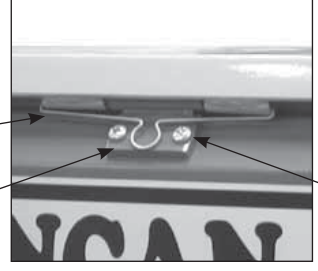


Location Tab Detail

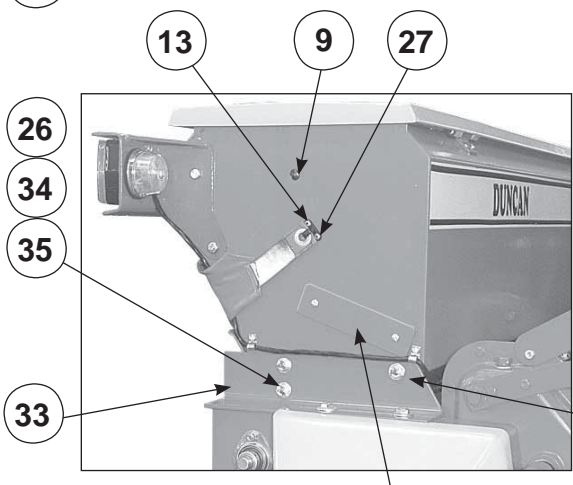
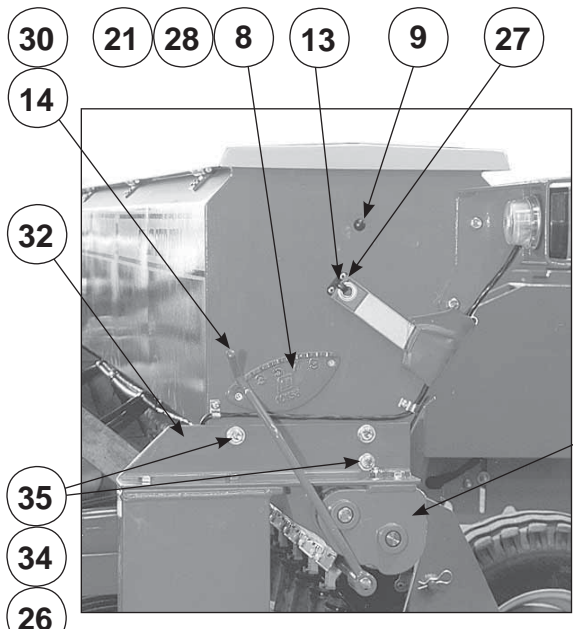


For Agitator Drive Detail Refer P28

Lid Hinge Detail



Latch Rod Detail



Roller Seed Drill Seedbox Assembly

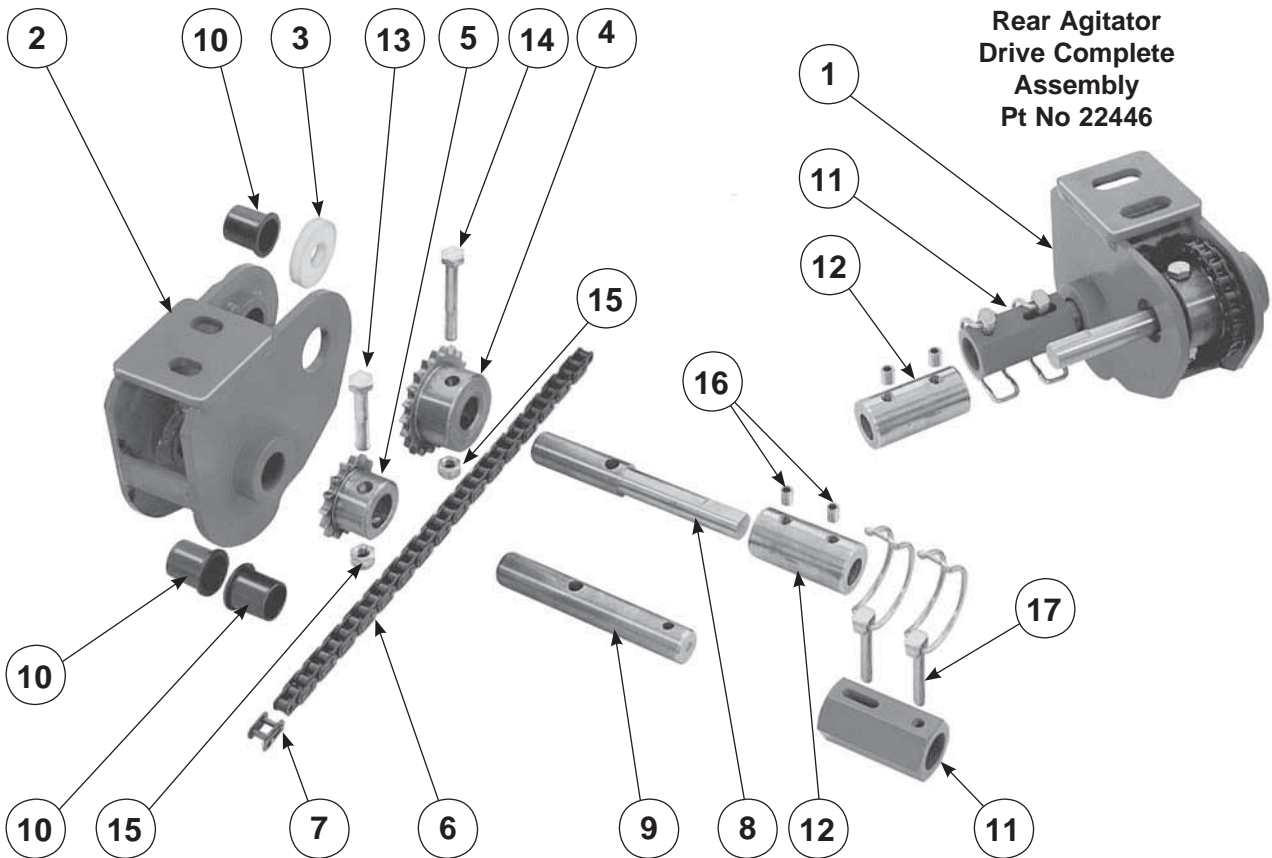
ITEM	PART No.	DESCRIPTION	QTY
1	Refer Below	Complete Seed Box Assembly	1
2	Refer Below	Combi Box Only	1
3	Refer Below	Box Lid Assembly	1
4	Refer Page 30	Seeder Assembly	*N
5	Refer Below	Box Shaft (20mm)	1
6	Refer Below	Flap Shaft (18mm)	1
7	Refer Below	Weather Skirt Holder	1
8	10158	Reverse Fertiliser Quadrant Plate	1
9	14442	Rubber Body Plug R187	10
10	22487	Latch Rod Assembly	1
11	22490	Hinge Assembly	3
12	22491	Hinge Pin	3
13	43430	Plastic Lashing Hook	2
14	22499	Rear Flap Handle Assembly	1
15	22568	Location Tab (Calibration Tray)	3
16	47615	6 x 40 Pipe Lynch Pin	4
17	22855	Agitator Access Blanking Plate	1
18	43373	Black Edge Trim (Refer Below for Length per Box)	1
19	23633	Box Shaft Connecting Sleeve	2
20	45122	M6 Class 8.8 Zinc Plated Hex Nut	4
21	45136	M6 Nylock Nut	32
22	45150	M6 Zinc Plated Light Flat Washer	12
23	45368	M10 Starlock Fixing Washer	4
24	27599	Hinge Pin Spring Clip	3
25	45401S	M6 x 16 Class 4.6 Zinc Plated Set Screw	2
26	45139	M12 Nylock Nut	12
27	45702	4.8 x 9.5 Monel Pop Rivet	4
28	45758	M6 x 16 Zinc Plated Countersunk Posidrive Screw	2
29	45908	M6 x 16 Zinc Plated Pan Head Posidrive Machine Screw	6
30	45185SS	M10 x 10 Socket Head Grubscrew	2
31	Refer Below	Roller Drill Transfer	1
32	24181	Box Set Mounting Bracket LH	1
33	24182	Box Set Mounting Bracket RH	1
34	45153	M12 Zinc Plated Light Flat Washer	12
35	45433	M12 x 30 Class 4.6 Zinc Plated Bolt	6
36	45907	M6 x 12 Zinc Plated Pan Head Posidrive Machine Screw	6

Part numbers for different width machines			
Item	8', 16 Run	9', 18 Run	10', 20 Run
1	24326	24327	24328
2	24264	24274	24284
3	24269	24279	24289
5	24198	24199	24200
6	24204	24205	24206
7	24211	24212	24213
18	5 metre	6 metre	7 metre
31	43705	43706	43707

*N Where N = number of seeders fitted. e.g. 18 for 18 Run Machine (see table below for part number).

Roller Seed Drill Agitator Drive

ITEM	PART No.	DESCRIPTION	QTY
1	22446	Rear Agitator Drive Complete	1
2	22415	Agitator Drive Rear Housing	1
3	22416	Agitator Drive Spacer	1
4	22418	3/8" Pitch x 20mm Bore 21T Sprocket	1
5	22422	3/8" Pitch x 20mm Bore 15T Sprocket	1
6	22417	3/8" Pitch x 33 Link BS Chain	1
7	43396	3/8" Pitch Joiner Link	1
8	22425	Agitator Shaft Extension	1
9	22426	Seed Shaft Extension	1
10	43428	Nylon Bush	3
11	22419	Box Shaft Connecting Sleeve	1
12	22420	Agitator Shaft Joining Collar	1
13	45398	M8 x 50 Class 4.6 Zinc Plated Bolt	1
14	45416	M8 x 60 Class 4.6 Zinc Plated Bolt	1
15	45137	M8 Nylock Nut	2
16	45185SS	M10 x 10 Stainless Steel Socket Head Grub Screw	2
17	47615	6 x 40 Pipe Lynch Pin	2

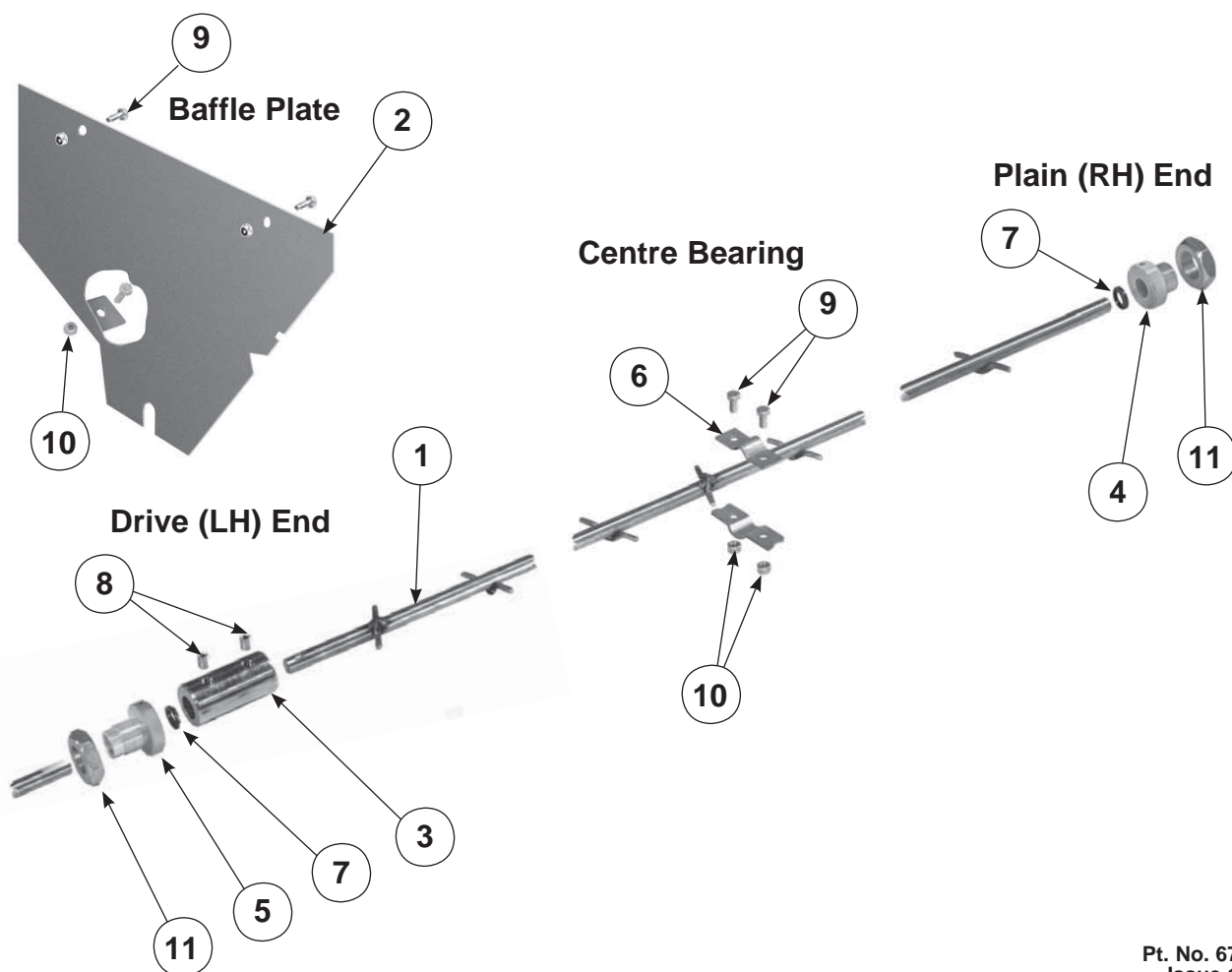


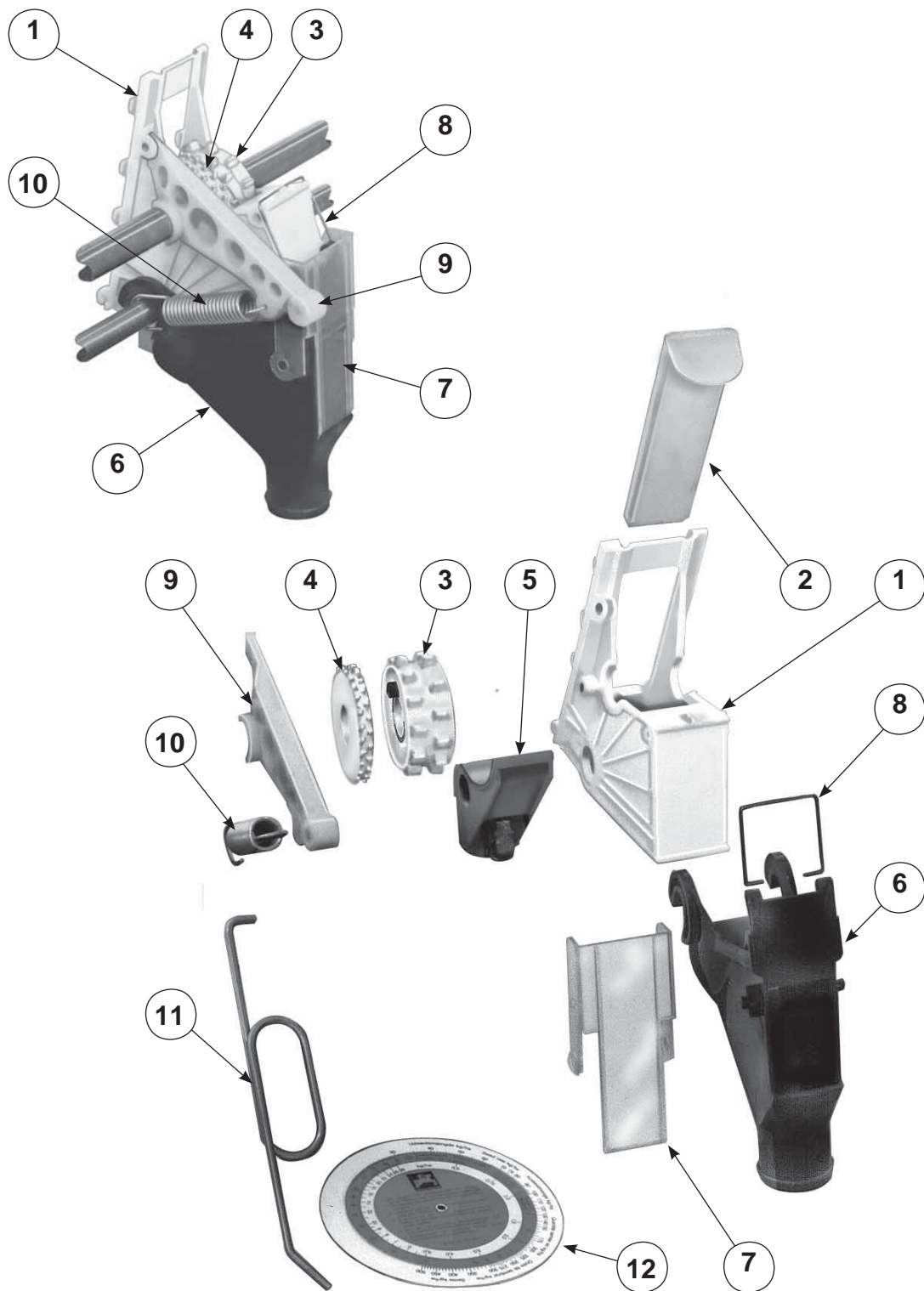
Roller Seed Drill Agitator Shaft Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	Refer Below	Agitator Shaft Assembly	1
2	Refer Below	Combi-Box Baffle Extension	-
3	22420	16mm Agitator Joining Collar	1
4	22423	Agitator Shaft Support RH (Short)	2
5	22424	Agitator Shaft Support LH (Long)	2
6	22428	Agitator Shaft Support Cap	*2
7	43442	5/8" Lurethane Wiper Seal	4
8	45185SS	M10 x 10 Stainless Steel Socket Head Grubscrew	2
9	Refer Below	M8 x 16 Grade 316 Stainless Steel Set Screw	-
10	Refer Below	M8 Grade 316 Stainless Steel Nylock Nut	-
11	47600	M30 ISO Fine Zinc Plated Hex Lock Nut	2

Part numbers for different width machines			
Item	8' 16 Run	9' 18 Run	10' 20 Run
1	24192	24193	24194
2	24250 (3)	24250 (3)	24250 (5)
10	45410SSS (11)	45410SSS (13)	45410SSS (19)
11	45137SS (11)	45137SS (13)	45137 (19)

* One only on 8' 16 Run Machine (Item 6)





Roller Seed Drill Seeder Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	43375	Metering Housing	1
2	43376	Shutter Slide	1
3	43377	Seed Metering Wheel Assembly	1
4	43374	Fine Seed Wheel	1
5	43378	Bottom Flap & Bolt Assembly	1
6	22550	Seeder Extension Funnel	1
7	22551	Seed Diverter	1
8	22548	Seeder Extension Spring Clip	1
9	43379	Seed Shaft Guide Bearing	1
10	43380	Guide Bearing Tension Spring	1
11	43382	Metering Wheel Clutch Hook	1
12	43383	Seed Rate Disc Calculator	1
13	24180	Roller Conductor Tube	1
14	11102	No. 42 Cray Clip	2



