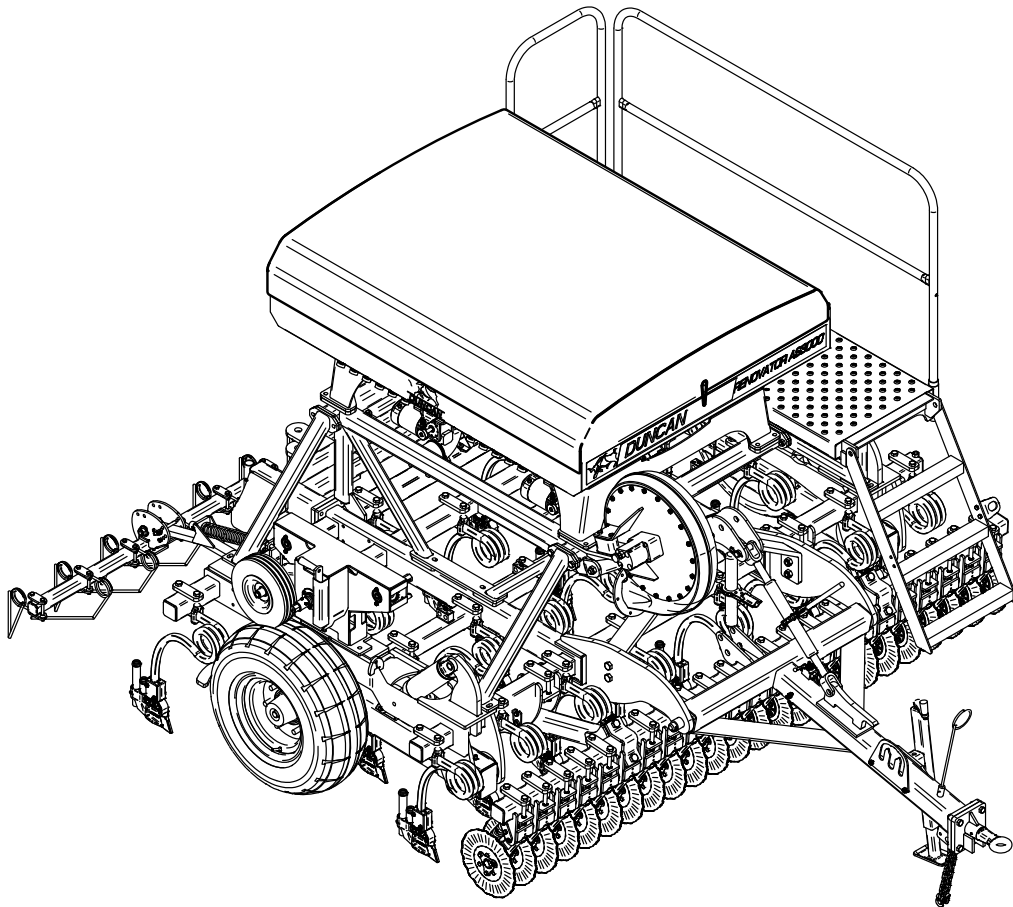


Owners Manual



Renovator AS3000 Renovator AS3500 ORIGINAL INSTRUCTIONS



Built to work.

Head Office:
P.O. Box 2018
Hilton Highway, Washdyke
Timaru, New Zealand
Telephone (03) 688 2029
Facsimile (03) 688 2821

Australian Branch:
4B Silverton Close
Laverton North 3026
Melbourne, Australia
Telephone (03) 9314-9666
Facsimile (03) 9314-6810

**Pt. No. 67396
Issue 0520**

Renovator AS3000/3500 Contents

	Page
Introduction	2
Acquisition & Warranty	2
Disclaimer	2
Description of Machine Working Principle	3
Specification Dimensions & Capacities	5
SAFETY - General Safety Symbols on Machine	6
Operator Safety	7
Be Prepared for Emergencies	7
Appropriate Dress	8
Transport This Machine Safely	8
Handle Agricultural Chemicals Safely	9
Avoid High Pressure Fluids	9
Safe Work Practices	9
Practise Safe Maintenance	10
SAFETY - Machine Specific Hazard Points	11
Safety Decals & Safety Guards	13
Transport	14
Setup, Calibration & Operating Procedure Read Before Operation	15
Pre-calibration setup flowchart	16
Calibration procedure	17
Hand Crank Turns for Seed Rate Calibration .	18
Calibration Deviations	19
16R 3.0m Sowing Chart	20
20R 3.5m Sowing Chart	22
21R 3.0m Sowing Chart	24
24R 3.0m Sowing Chart	26
24R 3.5m Sowing Chart	28
28R 3.5m Sowing Chart	30
Airflow & Fan Speed	32
Operation	33
Depth Control	34
Farmscan Jackal Settings	35
Blank Page for your Calibration Notes	37
Maintenance & Care General	38
Lubrication Instructions	39
Maintenance Schedule	40
Storage	42
Troubleshooting/Maintenance Notes	43
Commisioning/Troubleshooting Phasing Rams	44
Parts List Base Machine	49
Optional Extras	80

Introduction

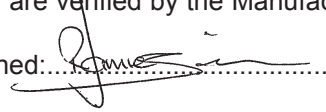
Acquisition & Warranty

On delivery of your new Duncan Renovator AS3000/3500 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 Renovator AS3000/3500 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

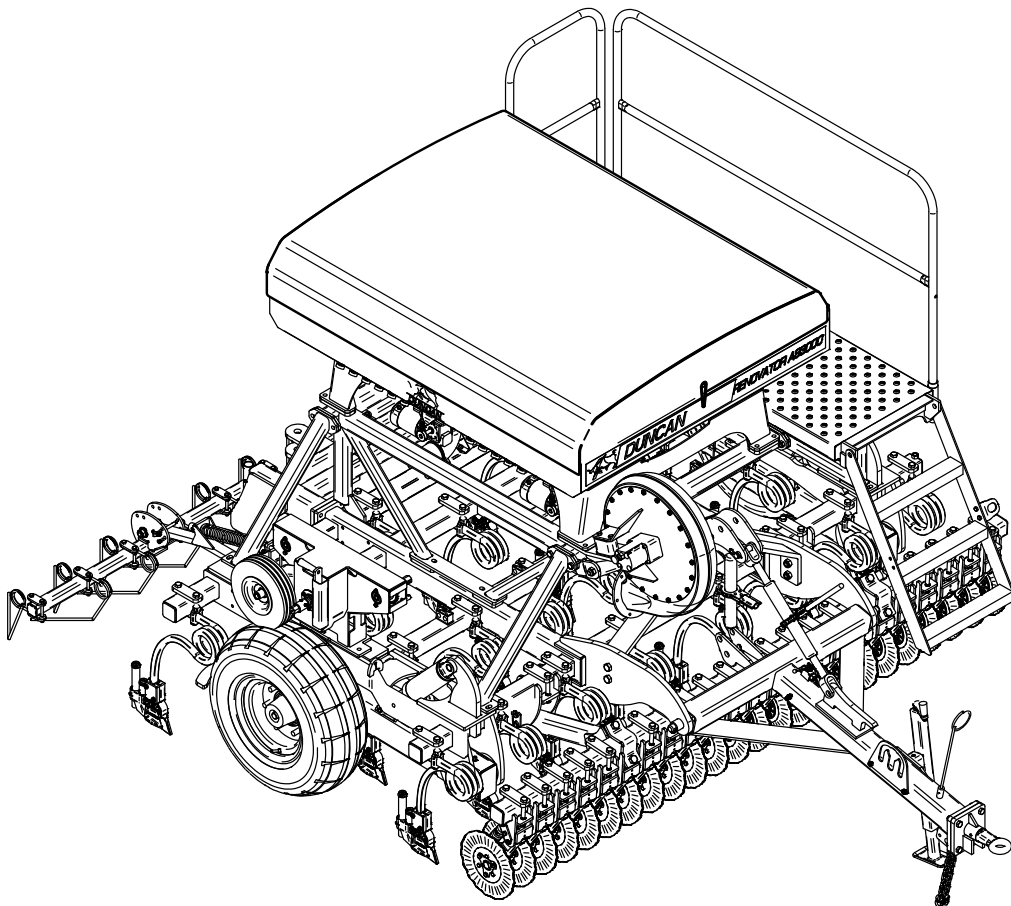
The Duncan 'Renovator AS3000/3500' is a Coil Tine T-boot drill.

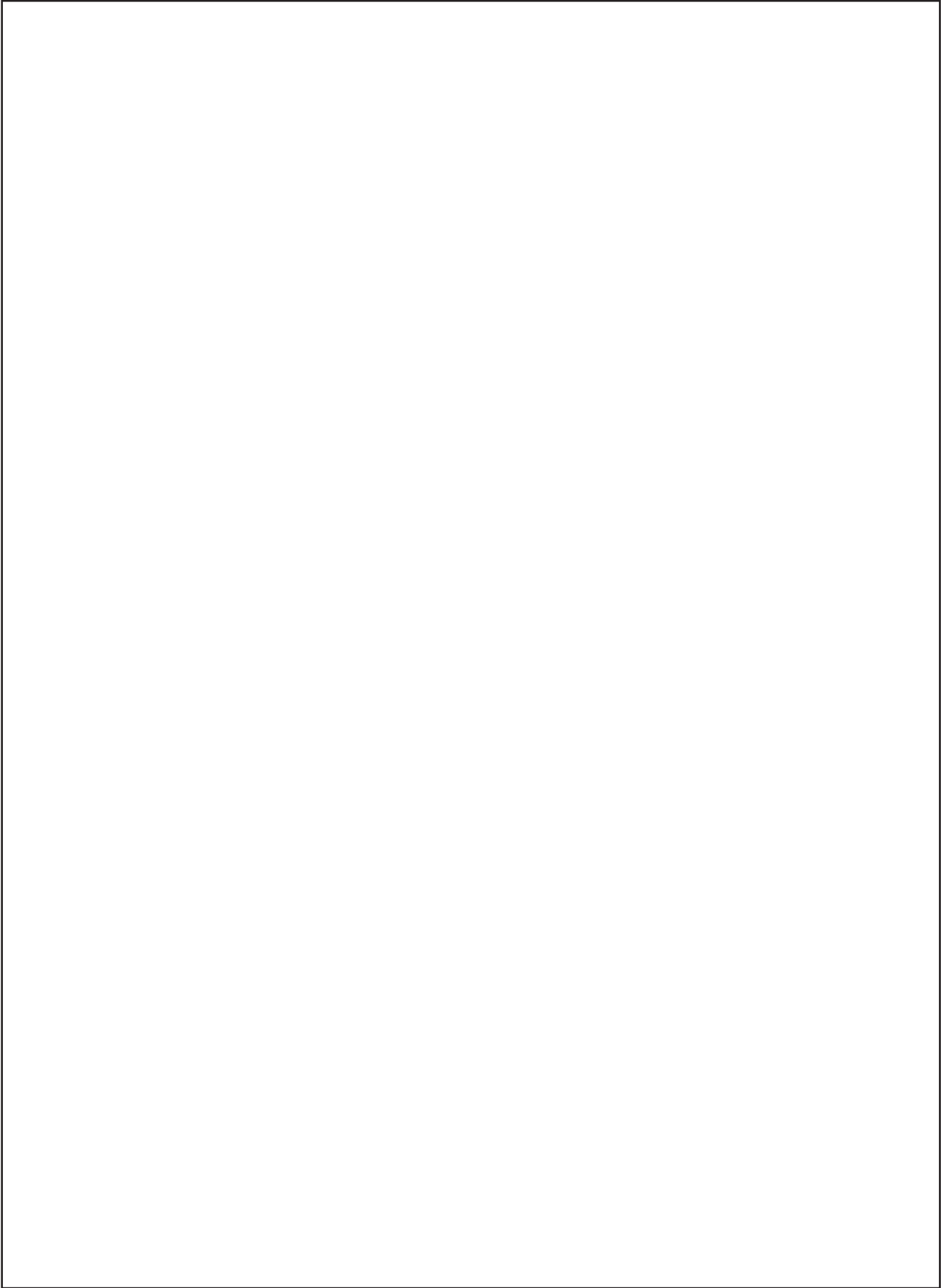
The large split hopper is mounted on a robust frame accommodating large diameter tyres.

Sowing depth is controlled by adjusting the hydraulic ram as required. The quality European air metering units handle all seeds from turnip and rape through to peas and maize and permits easy calibration. The seeders are driven via a jockey wheel with individually selected high or low ranges. For transport, the drive is easily disconnected by raising the drill to its transport height.

Working Principle

The air flow and metering units are set to give the desired sowing and/or fertilizer rate. The coil tine and T-boot, create the seed bed. Seed flows down the flexible tubes between seeder and tee-boot units, and drops into the prepared seed bed. Optional tine harrows and following roller enhance seed to soil contact.

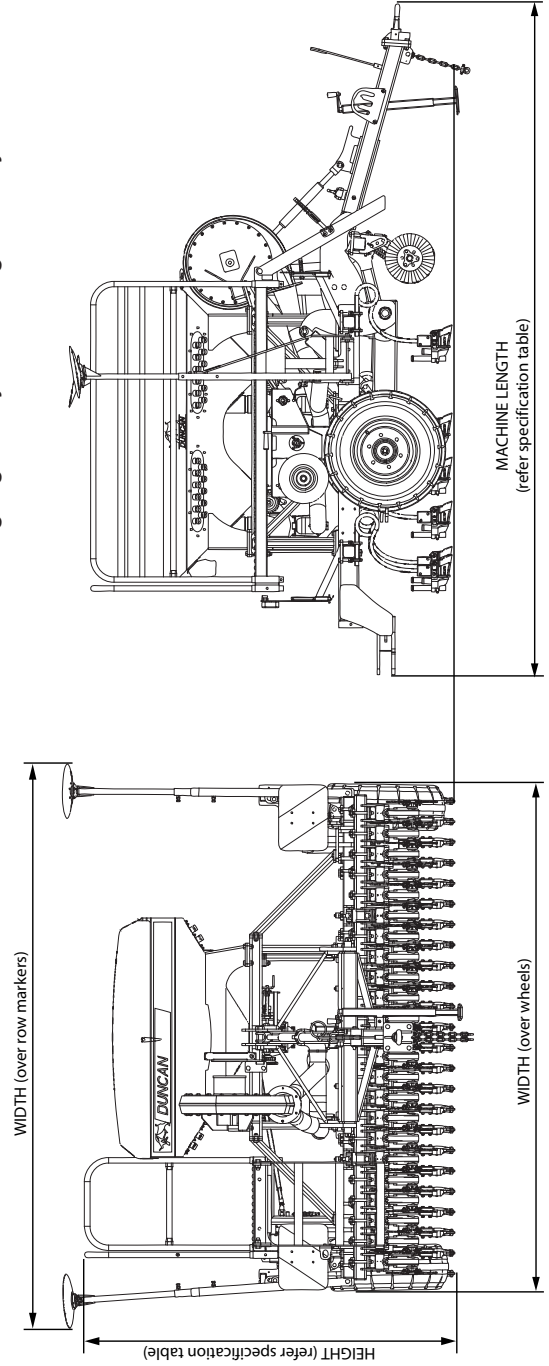




'Renovator AS3000/3500' Dimensions & Capacities

Dimensions & Capacities		16 Run	21 Run	24 Run	20 Run	24 Run	28 Run
Description		3m Wide	3m Std	3m Narrow	3.5m Wide	3.5m Std	3.5m Narrow
Width (over wheels /mm)			3070			3570	
Width (over row markers /mm)			3435			3955	
Height (Groundwheels up /mm)				2300			
Machine Length (mm)				4200			
Tyre Size		10.0/75-15.3 (18 ply AW702)					
Recommended Tyre Pressure		7 bar (101 psi)					
Maximum speed (km/hr)		40 (tyre rating 138A8)					
Jockey Tyre Size		410/350 x 6 x 4 ply					
Jockey Tyre Pressure*		3.44 bar (50 psi) -TYRE IS FILLED WITH ANTI-PUNCTURE SEALANT*					
Row Spacing		178	147.5	125	178	147.5	125
Effective Sowing Width		2848	3097.5	3000	3560	3540	3500
Box Capacity (litres per box)		700					
Tractor HP Rating range		110-180					
Tractor Hydraulic Flow Capacity		At least 40 litres per minute					

*Pressure gauges may be damaged if they are not filtered.



'Renovator AS3000/3500' Safety



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.



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.



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.



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.



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.)

'Renovator AS3000/3500' Safety

SAFETY - General

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



A **prohibition** should be observed under all circumstances.



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



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.



'Renovator AS3000/3500' Safety

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.

Adequate protection, such as a face mask, should be worn if operating this machine in dry and dusty conditions.



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 40km/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.



'Renovator AS3000/3500' Safety

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. respirator.

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.

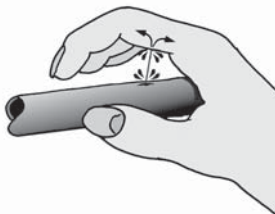
Avoid High Pressure Fluids

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.

Do not operate this equipment when severe weather conditions appear imminent.

'Renovator AS3000/3500' Safety

SAFETY - General (Continued)



Practice 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 the following hazards when dismantling or maintaining the machine:-
 - > Hydraulics under pressure
 - > Springs under tension or compression
- 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.



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.



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.

'Renovator AS3000/3500' Safety

SAFETY - Machine Specific

This section of the manual gives specific guidelines for the safe operation of the Renovator AS3000/3500.

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 7 to 10).

Hazard Points on the Renovator AS3000/3500

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 13.



No Ride

Passengers are not permitted anywhere on the machine.



Pinch Points/Moving Parts

Hazardous areas include:

- Drive chains.
- Sprockets between the jockey wheel, the transfer shaft and the output shaft.
- Universal joints and drive shafts
- Seed Metering units, box shaft and shaft connectors.
- Wheel legs and main frame assemblies
- Between discs and other sub-assembly parts (where fitted).
- Finger tine assemblies (where fitted).
- Hydraulic Fan.
- Row Markers.



Slippery
When
Wet

Slippery When Wet

Hazardous areas include:

- Footboards and footstep.
- All smooth surfaces on the frame structure.

KEEP CLEAR

Keep Clear

Hazardous areas include:

- Between the tractor and the Renovator AS3000/3500.
- Immediately adjacent to the Renovator AS3000/3500 side.

SAFETY - Machine Specific (Continued)



Hazard Points on the Renovator AS3000/3500 (Continued)

For guard locations on machine, refer Page 13.



Transport

The two wheels located at the sides of the machine are for the purpose of controlling sowing depth. These are also used to support the machine weight during transport (while linked to the tractor).

Important - Refer to safety cautions in the **Transport** section, page 14 of the manual. Ensure that all linkage pins and security clips are fitted correctly.

Maintenance

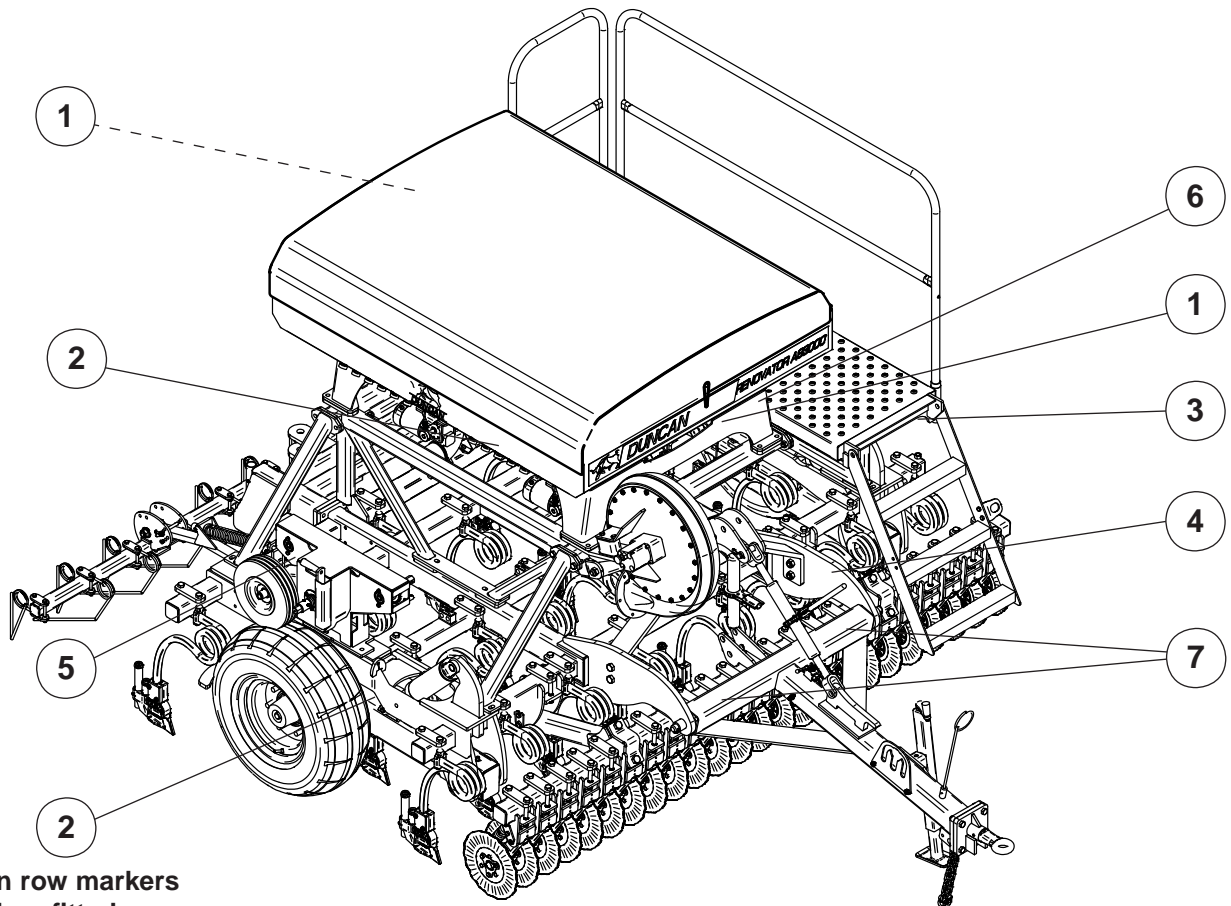
Refer Page 38 for reference to the **Maintenance and Care** section of the manual.

Lubrication

Refer Page 39 for reference to the **Maintenance and Care** section of the manual.

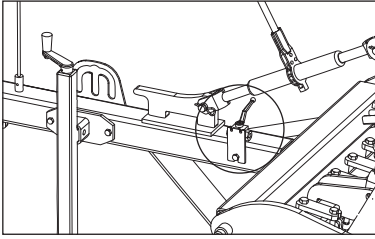
'Renovator AS3000/3500' Safety

SAFETY - Machine Specific (Continued)



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	Jockey Drive Swing Guard	25745	1
6	'40 km/hr'	43912	2
7	Lift Point'	14389	2

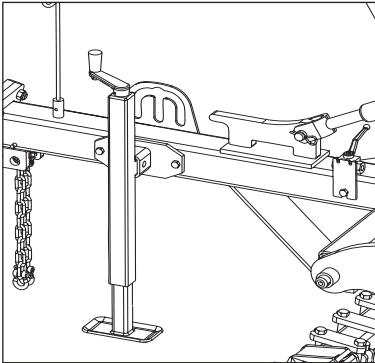
'Renovator AS3000/3500' Transport



Transport

1 Raise the drill into the transport position and hold at the full extent of the rams for a few seconds to allow cylinders to rephase/equalise.

2 **Important** - To avoid machine damage due to drill lowering during transport, always close the hydraulic valve on the drawbar. Move the handle to a position at 90° to the hydraulic line. This applies to the drawbar and disc opener hydraulic valves where fitted.



3 Locate jack stand in transport position, if fitted.4 Ensure lighting and oversize warning requirements meet recommendations published by the local Land Transport Authority or equivalent.

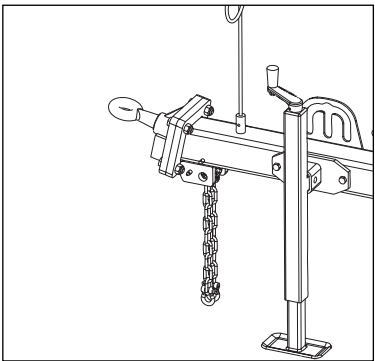


5 **Maximum towing speed 40 km/hr.** For countries other than New Zealand other speed restrictions may apply, please refer to your local transport authority.

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.



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 towing 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.

7 If the machine is fitted with row markers or other vertical extensions, check clearance under power lines en route.

8 **Important** - For greater disc opener ground clearance, adjust the ram or turnbuckle on the disc opener unit so they are at maximum height, and/or extend the drawbar ram or turnbuckle to level the machine chassis.

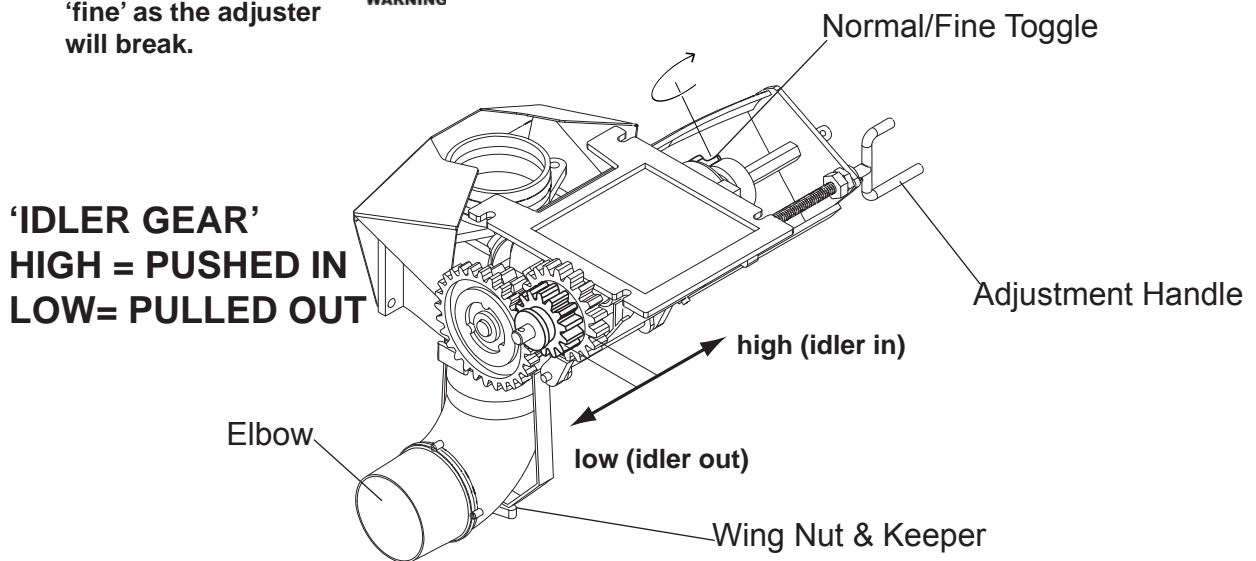
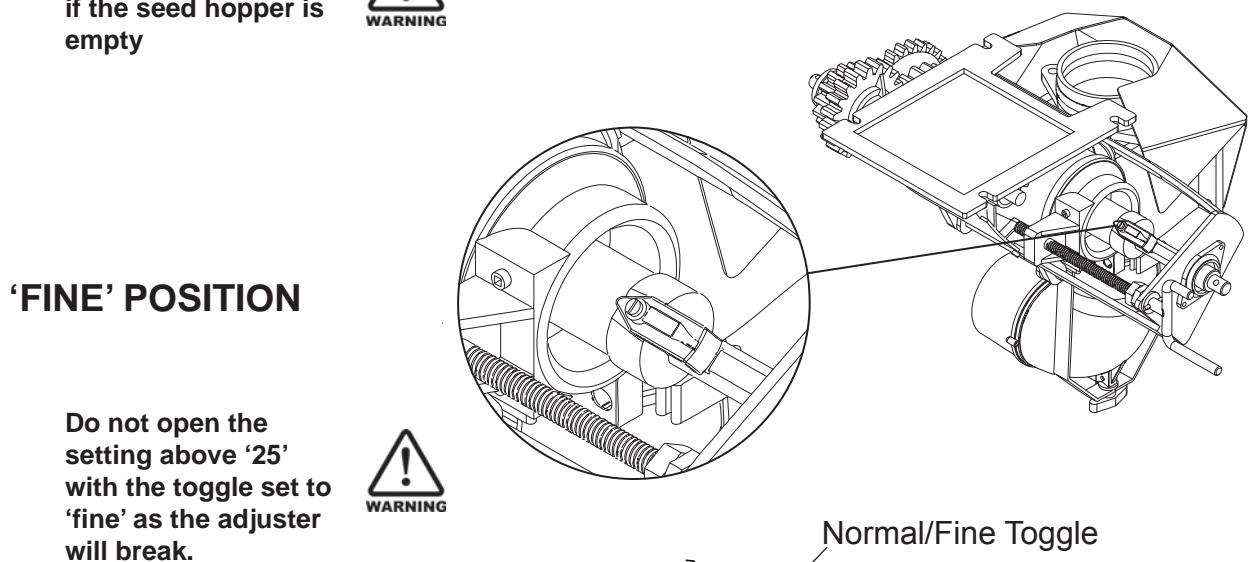
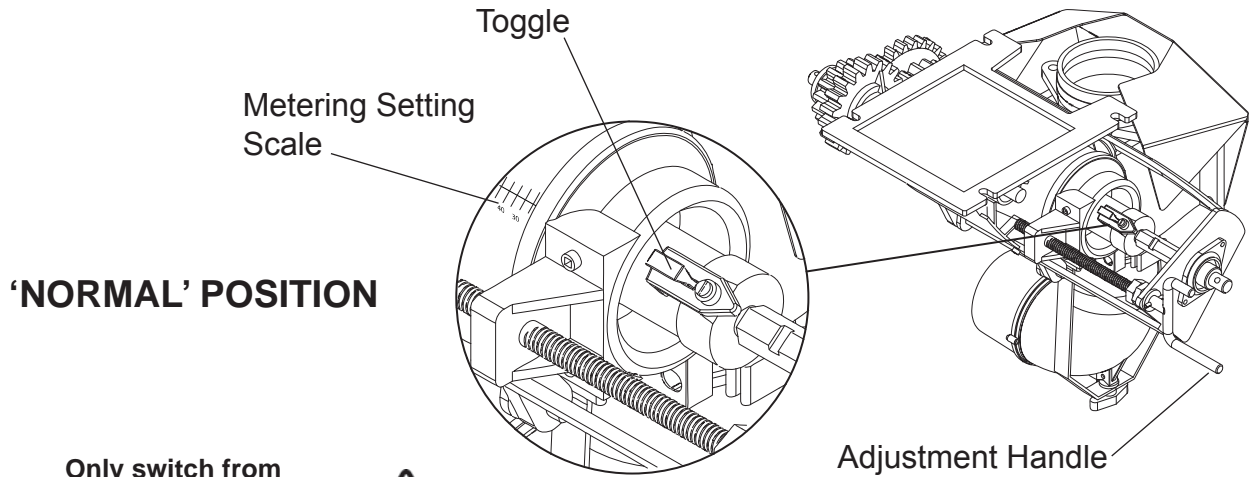


'Renovator AS3000/3500' Read Before Operation

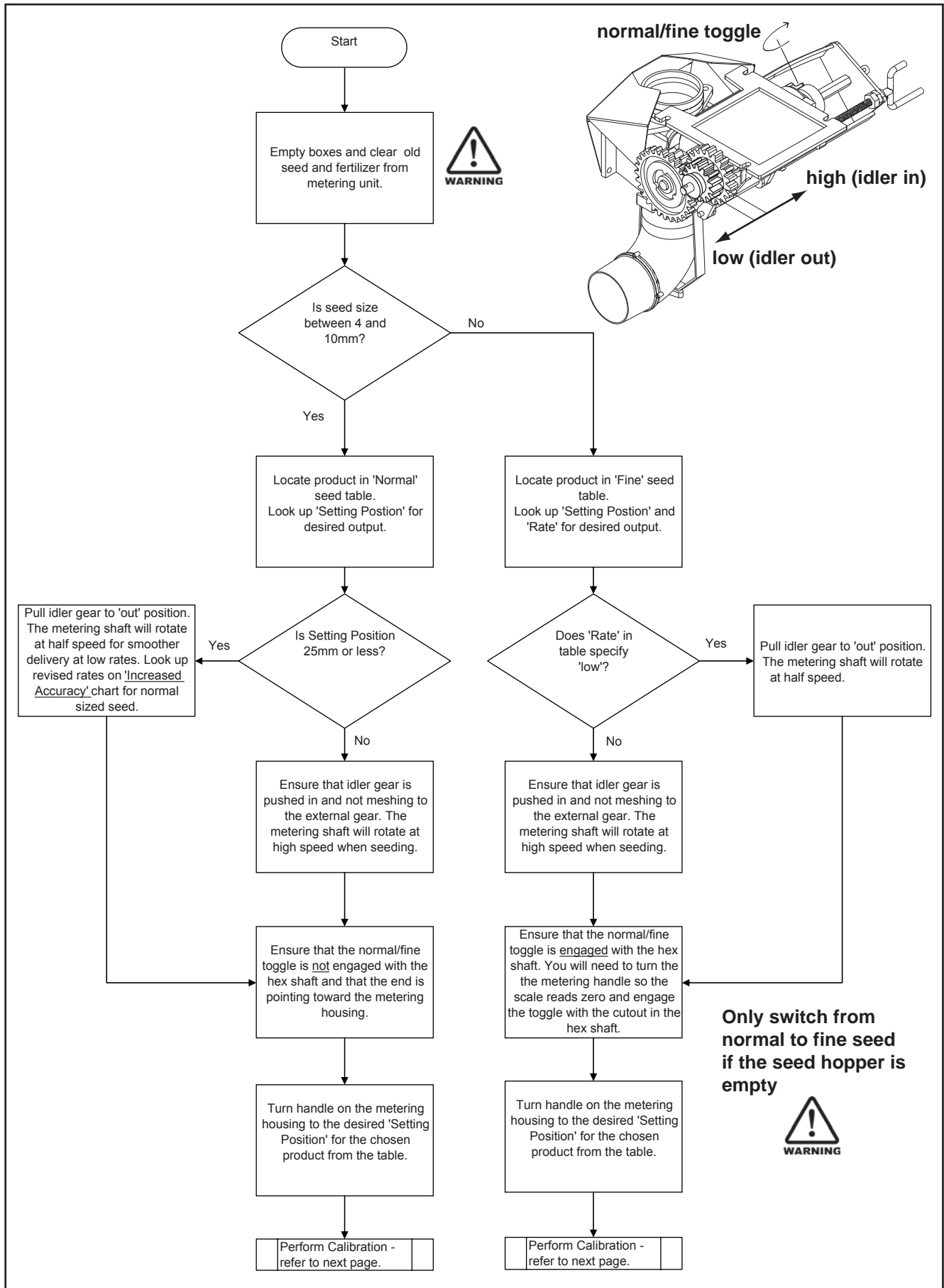
Components Referred to in the Pre-Calibration Setup and Calibration Process

The following pages describe how to set the machine up for calibration, the calibration process and subsequent adjustments to obtain the desired seed and/or fertilizer output.

Terms and words used in those instructions are shown below:-



'Renovator AS3000/3500' Pre-Calibration Setup



'Renovator AS3000/3500' Calibration

Seed Calibration

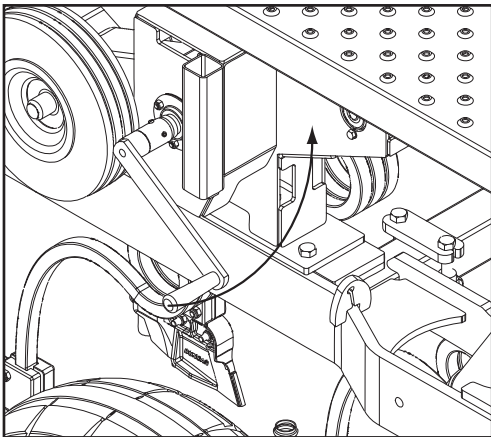
The calibration test should be done to confirm the settings of the required seed rate and is done with the drill stationary and level with the fan off.



The metering units must be set prior to filling with seed.

Seed Calibration Procedures

- 1 Ensure that the metering unit is free from debris. Close the trap-door.
- 2 Fill the appropriate bin. A minimum depth of 300mm is required for calibration with normal seeds.
- 3 Release the elbows from under the metering housings by unscrewing the wing nut and swinging the keeper out of the way. Move the elbow to one side.
- 4 Unhook the calibration tray from the rear of the machine, locate it on the guides and slide the tray under the bin outlets.
- 5 The bins are calibrated one-at-a-time; on the drive pedestal (outboard) end, remove the lynch pin and disconnect the unused driveshaft. Attach the end to the dummy shaft provided on the pedestal.
- 6 Place the crank handle over the hexagonal drive dog turn anti-clockwise until the seed flows consistently. To ensure complete filling of the seed unit continue turning the crank until an even flow of seed is coming out of the seeder units, then empty into the seedbox. The drill is now ready for calibration.
- 8 Refer to the table on the next page and turn the crank handle anticlockwise the number of turns for your machine.



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. ie: In the case of a 24R 3.0m machine, turn the crank handle 122 turns.

Scales must be accurate to 2 grams as any error will be multiplied by either 10 or 40 giving inaccurate calibration results.

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

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

'Renovator AS3000/3500' Calibration

Hand Crank Turns for Seed Rate Calibration

Machine Size	Row Spacing(mm)	Sowing Width (m)	Turns for 1/40 Hectare	Turns for 1/10 Hectare
16 Run	178	2.85	32	128
20 Run	178	3.56	25.5	102
21 Run	147.5	3.10	29.5	118
24 Run	147.5	3.54	26	103
24 Run	125	3.00	30.5	122
28 Run	125	3.50	26	104

- 9 Weigh the seed collected during the test in kilograms.

Caution: Scales must be accurate to 2 grams, as any error will be multiplied by either 10 or 40, giving inaccurate calibration results.

- 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 the requirement.

The seed rate should be correct. Large differences should be checked by recalibration. If there are still large errors, empty the seed bin, check the metering housings for wear or damage and start again from the pre-calibration setup.

- 11 Small errors, due to seed coatings or seed sizes may be corrected by adjusting the metering unit as follows:-

>Check and write down the **actual metering setting** on the metering unit.

>Write down the **actual seeding rate** that you calculated.

>Write down the **required seeding rate** (the number you *expected* from the calculation).

Calculate the error and correction as follows:-

$$\text{error} = \frac{\text{difference between actual and required seeding rate}}{\text{required seeding rate}}$$

$$\text{correction} = \text{error} \times \text{actual seeding rate}$$

- 12 If the **actual seeding rate** that you calculated is **smaller than** the **required seeding rate** then **increase** the metering setting by the **correction** amount.

- 13 Conversely, **reduce** the **metering setting** by the **correction** amount if the observed or **actual seeding rate** is **more than** the **required seeding rate**.

Care must be taken when the metering setting is significantly reduced as the unit can be damaged. If any resistance is felt, rotate the jockey wheel when adjusting the settings down. If the toggle is set to 'fine' and the settings needs to be reduced very low, empty the bin and start again.



- 14 Recalibrate from step 6.

- 15 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.

'Renovator AS3000/3500' Calibration

Wheel Slip Deviations

It is always possible with rubber tyred drills in extreme ground conditions to get wheel slip. Not normally a problem with cleated type tyres in good condition, but more so in the arable situation with the less aggressive tread patterns. The result: large differences between the calibration test and the actual sowing rate, obviously less seed deposited than required.

To check number of crank turns for calibration

Should you require to check this in a practical way proceed as follows:

For an area of 250m² (1/40 Hectare), the travel distance for your machine is shown below:-

Machine Size	Row Spacing (mm)	Travel Distance for 1/40Ha (metres)
16 Run	178	87.8
20 Run	178	70.2
21 Run	147.5	80.7
24 Run	147.5	70.6
24 Run	125	83.3
28 Run	125	71.4

Place the crank handle over the hexagonal drive dog on the gearbox.

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.

'Renovator 16 Run AS3000' Sowing Chart Normal

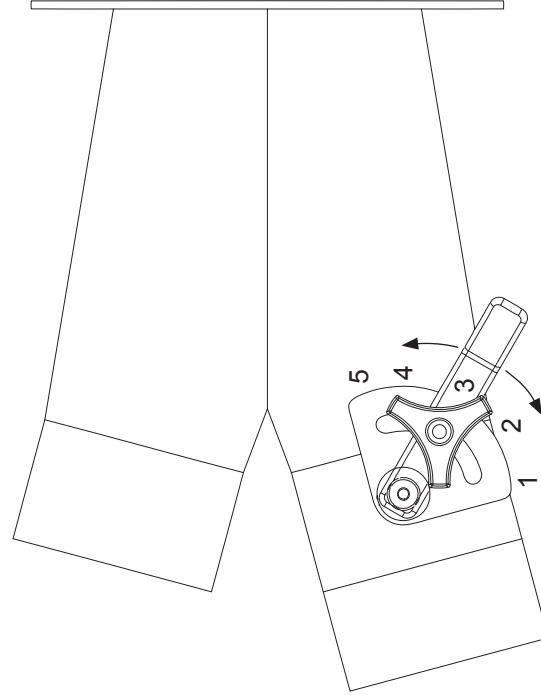
16 Run AS3000

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	34	51	69	86	104	122	140	157	174	192	210	228	246	264	281	298	316	335	352	370	387
Oats	0.5	high	24	35	47	59	71	82	94	106	118	130	141	153	165	177	189	200	212	224	236	248	260
Barley	0.7	high	32	48	64	79	95	111	127	143	159	174	190	206	222	238	253	268	284	300	316	332	348
Ryecom	0.7	high	33	49	66	83	100	117	134	151	168	184	200	217	235	252	269	286	302	319	337	354	371
Peas	0.8	high	21	40	59	78	97	117	136	155	174	194	213	232	251	270	289	309	328	347	366	385	404
Grass	0.4	high		18	26	34	42	50															
Pasture Mix	-	high		18	26	34	42	50															
DAP	1.0	high	39	58	77	97	116	135	155	174	193	213	232	251	270	290	309	328	348	367	386	406	425
Superphosphate	1.3	high	34	70	109	138	171	204	235	266	303	336	366	390	421	451	489	524	558	586	622	660	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	17	25.5	34.5	43	52
Oats	0.5	low	12	17.5	23.5	29.5	35.5
Barley	0.7	low	16	24	32	39.5	47.5
Ryecom	0.7	low	16.5	24.5	33	41.5	50
Peas	0.8	low	10.5	20	29.5	39	48.5
Grass	0.4	low	-	9	13	17	21
Pasture Mix	-	low	-	9	13	17	21



Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed - 2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

*MAXIMUM PERMISSIBLE SPEED 4000 RPM

'Renovator 16 Run AS3000' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

16R AS3000

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	1.10	3.06	4.60	6.49	7.93	9.34	11.28	12.95	14.39	15.50
Turnip	0.65	low	1.10	2.30	3.40	4.55	5.70	6.85	7.95	9.10	10.25	11.40
Kale	0.65	low	1.10	2.30	3.40	4.55	5.70	6.85	7.95	9.10	10.25	11.40
Swedes	0.65	low	1.10	2.30	3.40	4.55	5.70	6.85	7.95	9.10	10.25	11.40
Canola/Rape	0.65	low	1.10	2.30	3.40	4.55	5.70	6.85	7.95	9.10	10.25	11.40
White Clover	0.77	low	1.15	2.65	4.30	6.00	7.65	9.00	10.65	12.00	13.30	13.75
Red Clover	0.77	low	1.15	2.65	4.30	6.00	7.65	9.00	10.65	12.00	13.30	13.75
Grass	0.36	low			1.40	2.60	3.60	4.60	5.60	6.60	7.50	8.10
Millet	0.64	low		1.12	2.30	3.64	4.80	5.80	6.80	8.20	9.20	10.30
Grain Sorghum	0.56	low		0.32	2.80	6.00	7.50	8.50	10.50	12.20	13.70	15.70
Forage Sorghum	0.56	low		0.32	2.80	6.00	7.50	8.50	10.50	12.20	13.70	15.70
Chicory	0.54	low	0.58	1.84	2.90	4.08	5.06	6.24	7.53	8.61	9.54	10.39
Lucerne (Alfalfa)	0.77	high	2.20	6.12	9.20	12.98	15.86	18.68	22.56	25.90	28.78	31.00
Turnip	0.65	high	2.20	4.60	6.80	9.10	11.40	13.70	15.90	18.20	20.50	22.80
Kale	0.65	high	2.20	4.60	6.80	9.10	11.40	13.70	15.90	18.20	20.50	22.80
Swedes	0.65	high	2.20	4.60	6.80	9.10	11.40	13.70	15.90	18.20	20.50	22.80
Canola/Rape	0.65	high	2.20	4.60	6.80	9.10	11.40	13.70	15.90	18.20	20.50	22.80
White Clover	0.77	high	2.30	5.30	8.60	12.00	15.30	18.00	21.30	24.00	26.60	27.50
Red Clover	0.77	high	2.30	5.30	8.60	12.00	15.30	18.00	21.30	24.00	26.60	27.50
Grass	0.36	high			2.80	5.20	7.20	9.20	11.20	13.20	15.00	16.20
Millet	0.64	high		2.24	4.60	7.28	9.60	11.60	13.60	16.40	18.40	20.60
Grain Sorghum	0.56	high		0.64	5.60	12.00	15.00	17.00	21.00	24.40	27.40	31.40
Forage Sorghum	0.56	high		0.64	5.60	12.00	15.00	17.00	21.00	24.40	27.40	31.40
Chicory	0.54	high	1.16	3.68	5.80	8.16	10.12	12.48	15.06	17.22	19.08	20.78

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator 20 Run AS3500' Sowing Chart Normal

20 Run AS3500

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

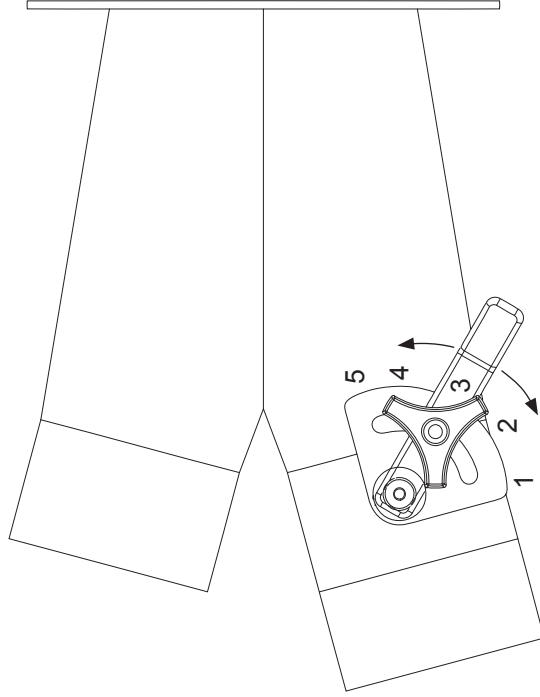
PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	27	41	55	69	83	97	112	125	139	153	167	182	196	210	224	237	252	267	281	295	308
Oats	0.5	high	19	28	37	47	57	65	75	84	94	104	112	122	131	141	151	159	169	179	188	198	207
Barley	0.7	high	26	38	51	63	76	88	101	114	127	139	151	164	177	190	202	214	226	239	252	265	277
Ryecom	0.7	high	26	39	53	66	80	93	107	120	134	147	159	173	187	201	214	228	241	254	269	282	296
Peas	0.8	high	17	32	47	62	77	93	108	124	139	155	170	185	200	215	230	246	261	277	292	307	322
Grass	0.4	high		14	21	27	33	40															
Pasture Mix	-	high		14	21	27	33	40															
DAP	1.0	high	31	46	61	77	92	108	124	139	154	170	185	200	215	231	246	261	277	292	308	324	339
Superphosphate	1.3	high	27	56	87	110	136	163	187	212	241	268	292	311	335	359	390	418	445	467	496	526	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	13.5	20.3	27.5	34.3	41.4
Oats	0.5	low	9.6	13.9	18.7	23.5	28.3
Barley	0.7	low	12.8	19.1	25.5	31.5	37.9
Ryecom	0.7	low	13.1	19.5	26.3	33.1	39.8
Peas	0.8	low	8.4	15.9	23.5	31.1	38.6
Grass	0.4	low	-	7.2	10.4	13.5	16.7
Pasture Mix	-	low	-	7.2	10.4	13.5	16.7

Box contents		Butterfly Position (affects rear box)		Fan Speed/rpm*
FRONT	REAR			
seed (Normal)	seed (Normal)	open - 5		3000
seed (Normal)	seed (Fine)	closed - 1		3000
Fertilizer	seed (Normal)	closed - 2		3000 to 3500
Fertilizer	seed (Fine)	closed - 1		3000 to 3500

*MAXIMUM PERMISSIBLE SPEED 4000 RPM



'Renovator 20 Run AS3500' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

20R AS3500

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	0.88	2.44	3.67	5.17	6.32	7.44	8.99	10.32	11.47	12.35
Turnip	0.65	low	0.88	1.83	2.71	3.63	4.54	5.46	6.34	7.25	8.17	9.08
Kale	0.65	low	0.88	1.83	2.71	3.63	4.54	5.46	6.34	7.25	8.17	9.08
Swedes	0.65	low	0.88	1.83	2.71	3.63	4.54	5.46	6.34	7.25	8.17	9.08
Canola/Rape	0.65	low	0.88	1.83	2.71	3.63	4.54	5.46	6.34	7.25	8.17	9.08
White Clover	0.77	low	0.92	2.11	3.43	4.78	6.10	7.17	8.49	9.56	10.60	10.96
Red Clover	0.77	low	0.92	2.11	3.43	4.78	6.10	7.17	8.49	9.56	10.60	10.96
Grass	0.36	low			1.12	2.07	2.87	3.67	4.46	5.26	5.98	6.45
Millet	0.64	low		0.89	1.83	2.90	3.83	4.62	5.42	6.53	7.33	8.21
Grain Sorghum	0.56	low		0.26	2.23	4.78	5.98	6.77	8.37	9.72	10.92	12.51
Forage Sorghum	0.56	low		0.26	2.23	4.78	5.98	6.77	8.37	9.72	10.92	12.51
Chicory	0.54	low	0.46	1.47	2.31	3.25	4.03	4.97	6.00	6.86	7.60	8.28
Lucerne (Alfalfa)	0.77	high	1.75	4.88	7.33	10.34	12.64	14.89	17.98	20.64	22.93	24.70
Turnip	0.65	high	1.75	3.67	5.42	7.25	9.08	10.92	12.67	14.50	16.34	18.17
Kale	0.65	high	1.75	3.67	5.42	7.25	9.08	10.92	12.67	14.50	16.34	18.17
Swedes	0.65	high	1.75	3.67	5.42	7.25	9.08	10.92	12.67	14.50	16.34	18.17
Canola/Rape	0.65	high	1.75	3.67	5.42	7.25	9.08	10.92	12.67	14.50	16.34	18.17
White Clover	0.77	high	1.83	4.22	6.85	9.56	12.19	14.34	16.97	19.13	21.20	21.91
Red Clover	0.77	high	1.83	4.22	6.85	9.56	12.19	14.34	16.97	19.13	21.20	21.91
Grass	0.36	high			2.23	4.14	5.74	7.33	8.93	10.52	11.95	12.91
Millet	0.64	high		1.79	3.67	5.80	7.65	9.24	10.84	13.07	14.66	16.42
Grain Sorghum	0.56	high		0.51	4.46	9.56	11.95	13.55	16.73	19.44	21.83	25.02
Forage Sorghum	0.56	high		0.51	4.46	9.56	11.95	13.55	16.73	19.44	21.83	25.02
Chicory	0.54	high	0.92	2.93	4.62	6.50	8.06	9.95	12.00	13.72	15.20	16.56

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator 21 Run AS3000' Sowing Chart Normal

21 Run AS3000

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

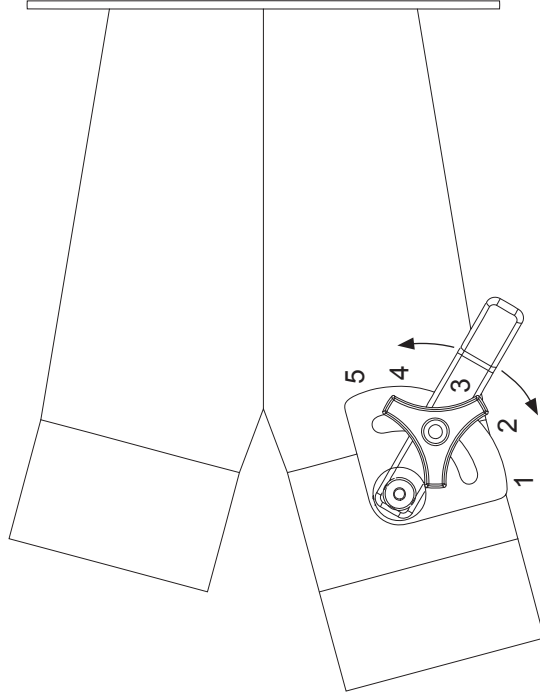
PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	31	47	64	79	96	112	129	145	160	177	194	210	227	243	259	275	291	309	325	341	357
Oats	0.5	high	22	32	43	54	65	76	87	98	109	120	130	141	152	163	174	184	195	207	218	229	240
Barley	0.7	high	30	44	59	73	88	102	117	132	147	160	175	190	205	219	233	247	262	277	291	306	321
Ryecom	0.7	high	30	45	61	77	92	108	124	139	155	170	184	200	217	232	248	264	278	294	311	326	342
Peas	0.8	high	19	37	54	72	89	108	125	143	160	179	196	214	231	249	266	285	302	320	337	355	372
Grass	0.4	high		17	24	31	39	46															
Pasture Mix	-	high		17	24	31	39	46															
DAP	1.0	high	36	53	71	89	107	124	143	160	178	196	214	231	249	267	285	302	321	338	356	374	392
Superphosphate	1.3	high	31	65	100	127	158	188	217	245	279	310	337	360	388	416	451	483	514	540	573	608	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	15.7	23.5	31.8	39.6	47.9
Oats	0.5	low	11.1	16.1	21.7	27.2	32.7
Barley	0.7	low	14.8	22.1	29.5	36.4	43.8
Ryecom	0.7	low	15.2	22.6	30.4	38.3	46.1
Peas	0.8	low	9.7	18.4	27.2	36.0	44.7
Grass	0.4	low	-	8.3	12.0	15.7	19.4
Pasture Mix	-	low	-	8.3	12.0	15.7	19.4

Box contents		Butterfly Position (affects rear box)		Fan Speed/rpm*
FRONT	REAR			
seed (Normal)	seed (Normal)	open	- 5	3000
seed (Normal)	seed (Fine)	closed	- 1	3000
Fertilizer	seed (Normal)	closed	- 2	3000 to 3500
Fertilizer	seed (Fine)	closed	- 1	3000 to 3500

*MAXIMUM PERMISSIBLE SPEED 4000 RPM



'Renovator 21 Run AS3000' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

21R AS3000

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	1.01	2.82	4.24	5.98	7.31	8.61	10.40	11.94	13.27	14.29
Turnip	0.65	low	1.01	2.12	3.13	4.19	5.25	6.31	7.33	8.39	9.45	10.51
Kale	0.65	low	1.01	2.12	3.13	4.19	5.25	6.31	7.33	8.39	9.45	10.51
Swedes	0.65	low	1.01	2.12	3.13	4.19	5.25	6.31	7.33	8.39	9.45	10.51
Canola/Rape	0.65	low	1.01	2.12	3.13	4.19	5.25	6.31	7.33	8.39	9.45	10.51
White Clover	0.77	low	1.06	2.44	3.96	5.53	7.05	8.30	9.82	11.06	12.26	12.68
Red Clover	0.77	low	1.06	2.44	3.96	5.53	7.05	8.30	9.82	11.06	12.26	12.68
Grass	0.36	low			1.29	2.40	3.32	4.24	5.16	6.08	6.91	7.47
Millet	0.64	low		1.03	2.12	3.36	4.43	5.35	6.27	7.56	8.48	9.50
Grain Sorghum	0.56	low		0.30	2.58	5.53	6.91	7.84	9.68	11.25	12.63	14.47
Forage Sorghum	0.56	low		0.30	2.58	5.53	6.91	7.84	9.68	11.25	12.63	14.47
Chicory	0.54	low	0.53	1.70	2.67	3.76	4.66	5.75	6.94	7.94	8.79	9.58
Lucerne (Alfalfa)	0.77	high	2.03	5.64	8.48	11.97	14.62	17.22	20.80	23.88	26.53	28.58
Turnip	0.65	high	2.03	4.24	6.27	8.39	10.51	12.63	14.66	16.78	18.90	21.02
Kale	0.65	high	2.03	4.24	6.27	8.39	10.51	12.63	14.66	16.78	18.90	21.02
Swedes	0.65	high	2.03	4.24	6.27	8.39	10.51	12.63	14.66	16.78	18.90	21.02
Canola/Rape	0.65	high	2.03	4.24	6.27	8.39	10.51	12.63	14.66	16.78	18.90	21.02
White Clover	0.77	high	2.12	4.89	7.93	11.06	14.10	16.59	19.64	22.13	24.52	25.35
Red Clover	0.77	high	2.12	4.89	7.93	11.06	14.10	16.59	19.64	22.13	24.52	25.35
Grass	0.36	high			2.58	4.79	6.64	8.48	10.33	12.17	13.83	14.93
Millet	0.64	high		2.07	4.24	6.71	8.85	10.69	12.54	15.12	16.96	18.99
Grain Sorghum	0.56	high		0.59	5.16	11.06	13.83	15.67	19.36	22.49	25.26	28.95
Forage Sorghum	0.56	high		0.59	5.16	11.06	13.83	15.67	19.36	22.49	25.26	28.95
Chicory	0.54	high	1.07	3.39	5.35	7.52	9.33	11.51	13.88	15.87	17.59	19.16

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator 24 Run AS3000' Sowing Chart Normal

24 Run AS3000

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

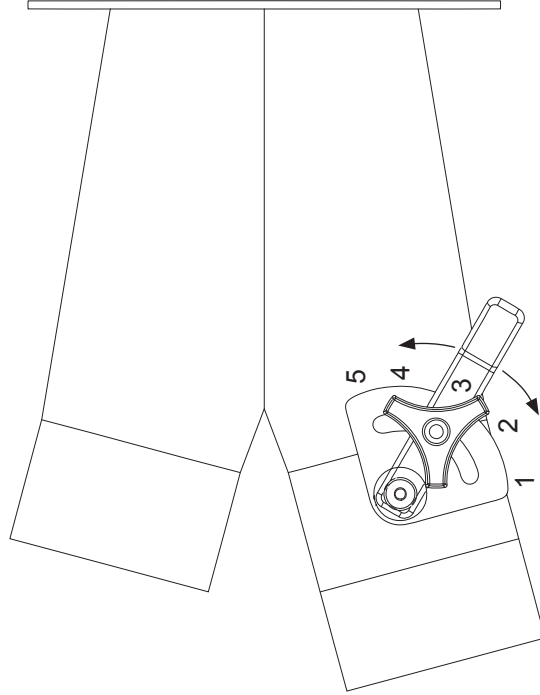
PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	32	49	66	82	99	116	133	150	166	183	200	217	234	252	268	284	301	319	336	353	369
Oats	0.5	high	23	33	45	56	68	78	90	101	112	124	134	146	157	169	180	191	202	214	225	236	248
Barley	0.7	high	31	46	61	75	91	106	121	136	152	166	181	196	212	227	241	255	271	286	301	316	332
Ryecom	0.7	high	31	47	63	79	95	112	128	144	160	175	191	207	224	240	256	273	288	304	321	337	354
Peas	0.8	high	20	38	56	74	92	112	130	148	166	185	203	221	239	257	275	295	313	331	349	367	385
Grass	0.4	high		17	25	32	40	48															
Pasture Mix	-	high		17	25	32	40	48															
DAP	1.0	high	37	55	73	92	111	129	148	166	184	203	221	239	257	276	295	313	332	350	368	387	405
Superphosphate	1.3	high	32	67	104	132	163	194	224	254	289	320	349	372	401	430	466	499	532	559	593	629	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	16.2	24.3	32.9	41.0	49.6
Oats	0.5	low	11.4	16.7	22.4	28.1	33.8
Barley	0.7	low	15.3	22.9	30.5	37.6	45.3
Ryecom	0.7	low	15.7	23.4	31.5	39.6	47.7
Peas	0.8	low	10.0	19.1	28.1	37.2	46.2
Grass	0.4	low	-	8.6	12.4	16.2	20.0
Pasture Mix	-	low	-	8.6	12.4	16.2	20.0

Box contents		Butterfly Position (affects rear box)		Fan Speed/rpm*
FRONT	REAR			
seed (Normal)	seed (Normal)	open	- 5	3000
seed (Normal)	seed (Fine)	closed	- 1	3000
Fertilizer	seed (Normal)	closed	- 2	3000 to 3500
Fertilizer	seed (Fine)	closed	- 1	3000 to 3500

*MAXIMUM PERMISSABLE SPEED 4000 RPM



'Renovator 24 Run AS3000' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

24R AS3000

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	1.05	2.92	4.38	6.19	7.56	8.90	10.75	12.34	13.72	14.77
Turnip	0.65	low	1.05	2.19	3.24	4.34	5.43	6.53	7.58	8.67	9.77	10.87
Kale	0.65	low	1.05	2.19	3.24	4.34	5.43	6.53	7.58	8.67	9.77	10.87
Swedes	0.65	low	1.05	2.19	3.24	4.34	5.43	6.53	7.58	8.67	9.77	10.87
Canola/Rape	0.65	low	1.05	2.19	3.24	4.34	5.43	6.53	7.58	8.67	9.77	10.87
White Clover	0.77	low	1.10	2.53	4.10	5.72	7.29	8.58	10.15	11.44	12.68	13.11
Red Clover	0.77	low	1.10	2.53	4.10	5.72	7.29	8.58	10.15	11.44	12.68	13.11
Grass	0.36	low			1.33	2.48	3.43	4.38	5.34	6.29	7.15	7.72
Millet	0.64	low		1.07	2.19	3.47	4.58	5.53	6.48	7.82	8.77	9.82
Grain Sorghum	0.56	low		0.31	2.67	5.72	7.15	8.10	10.01	11.63	13.06	14.96
Forage Sorghum	0.56	low		0.31	2.67	5.72	7.15	8.10	10.01	11.63	13.06	14.96
Chicory	0.54	low	0.55	1.75	2.76	3.89	4.82	5.95	7.18	8.21	9.09	9.90
Lucerne (Alfalfa)	0.77	high	2.10	5.83	8.77	12.37	15.12	17.80	21.50	24.69	27.43	29.55
Turnip	0.65	high	2.10	4.38	6.48	8.67	10.87	13.06	15.15	17.35	19.54	21.73
Kale	0.65	high	2.10	4.38	6.48	8.67	10.87	13.06	15.15	17.35	19.54	21.73
Swedes	0.65	high	2.10	4.38	6.48	8.67	10.87	13.06	15.15	17.35	19.54	21.73
Canola/Rape	0.65	high	2.10	4.38	6.48	8.67	10.87	13.06	15.15	17.35	19.54	21.73
White Clover	0.77	high	2.19	5.05	8.20	11.44	14.58	17.16	20.30	22.88	25.35	26.21
Red Clover	0.77	high	2.19	5.05	8.20	11.44	14.58	17.16	20.30	22.88	25.35	26.21
Grass	0.36	high			2.67	4.96	6.86	8.77	10.68	12.58	14.30	15.44
Millet	0.64	high		2.14	4.38	6.94	9.15	11.06	12.96	15.63	17.54	19.63
Grain Sorghum	0.56	high		0.61	5.34	11.44	14.30	16.20	20.02	23.26	26.12	29.93
Forage Sorghum	0.56	high		0.61	5.34	11.44	14.30	16.20	20.02	23.26	26.12	29.93
Chicory	0.54	high	1.11	3.51	5.53	7.78	9.65	11.90	14.35	16.41	18.19	19.81

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator 24 Run AS3500' Sowing Chart Normal

24 Run AS3500

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

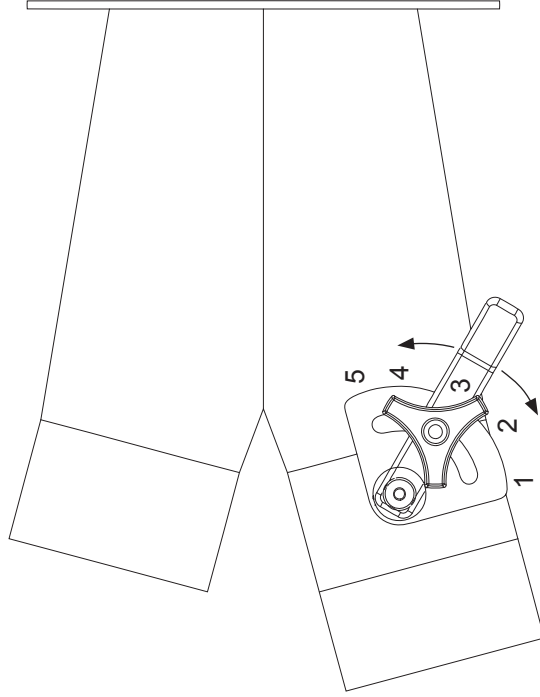
PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	27	41	56	69	84	98	113	126	140	155	169	183	198	212	226	240	254	270	283	298	311
Oats	0.5	high	19	28	38	47	57	66	76	85	95	105	113	123	133	142	152	161	171	180	190	200	209
Barley	0.7	high	26	39	52	64	76	89	102	115	128	140	153	166	179	192	204	216	229	241	254	267	280
Ryecom	0.7	high	27	39	53	67	80	94	108	122	135	148	161	175	189	203	216	230	243	257	271	285	299
Peas	0.8	high	17	32	47	63	78	94	109	125	140	156	171	187	202	217	233	249	264	279	295	310	325
Grass	0.4	high		14	21	27	34	40															
Pasture Mix	-	high		14	21	27	34	40															
DAP	1.0	high	31	47	62	78	93	109	125	140	155	171	187	202	217	233	249	264	280	295	311	327	342
Superphosphate	1.3	high	27	56	88	111	138	164	189	214	244	270	295	314	339	363	393	422	449	472	501	531	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	13.7	20.5	27.8	34.6	41.8
Oats	0.5	low	9.7	14.1	18.9	23.7	28.6
Barley	0.7	low	12.9	19.3	25.8	31.8	38.2
Ryecom	0.7	low	13.3	19.7	26.6	33.4	40.2
Peas	0.8	low	8.4	16.1	23.7	31.4	39.0
Grass	0.4	low	-	7.2	10.5	13.7	16.9
Pasture Mix	-	low	-	7.2	10.5	13.7	16.9

Box contents		Butterfly Position (affects rear box)		Fan Speed/rpm*
FRONT	REAR			
seed (Normal)	seed (Normal)	open	- 5	3000
seed (Normal)	seed (Fine)	closed	- 1	3000
Fertilizer	seed (Normal)	closed	-2	3000 to 3500
Fertilizer	seed (Fine)	closed	- 1	3000 to 3500

*MAXIMUM PERMISSIBLE SPEED 4000 RPM



'Renovator 24 Run AS3500' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

24R AS3500

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	0.89	2.46	3.70	5.22	6.38	7.52	9.08	10.42	11.58	12.47
Turnip	0.65	low	0.89	1.85	2.74	3.66	4.59	5.51	6.40	7.32	8.25	9.17
Kale	0.65	low	0.89	1.85	2.74	3.66	4.59	5.51	6.40	7.32	8.25	9.17
Swedes	0.65	low	0.89	1.85	2.74	3.66	4.59	5.51	6.40	7.32	8.25	9.17
Canola/Rape	0.65	low	0.89	1.85	2.74	3.66	4.59	5.51	6.40	7.32	8.25	9.17
White Clover	0.77	low	0.93	2.13	3.46	4.83	6.16	7.24	8.57	9.66	10.70	11.06
Red Clover	0.77	low	0.93	2.13	3.46	4.83	6.16	7.24	8.57	9.66	10.70	11.06
Grass	0.36	low			1.13	2.09	2.90	3.70	4.51	5.31	6.04	6.52
Millet	0.64	low		0.90	1.85	2.93	3.86	4.67	5.47	6.60	7.40	8.29
Grain Sorghum	0.56	low		0.26	2.25	4.83	6.04	6.84	8.45	9.82	11.02	12.63
Forage Sorghum	0.56	low		0.26	2.25	4.83	6.04	6.84	8.45	9.82	11.02	12.63
Chicory	0.54	low	0.47	1.48	2.33	3.28	4.07	5.02	6.06	6.93	7.68	8.36
Lucerne (Alfalfa)	0.77	high	1.77	4.92	7.40	10.44	12.76	15.03	18.15	20.84	23.16	24.95
Turnip	0.65	high	1.77	3.70	5.47	7.32	9.17	11.02	12.79	14.65	16.50	18.35
Kale	0.65	high	1.77	3.70	5.47	7.32	9.17	11.02	12.79	14.65	16.50	18.35
Swedes	0.65	high	1.77	3.70	5.47	7.32	9.17	11.02	12.79	14.65	16.50	18.35
Canola/Rape	0.65	high	1.77	3.70	5.47	7.32	9.17	11.02	12.79	14.65	16.50	18.35
White Clover	0.77	high	1.85	4.26	6.92	9.66	12.31	14.48	17.14	19.31	21.40	22.13
Red Clover	0.77	high	1.85	4.26	6.92	9.66	12.31	14.48	17.14	19.31	21.40	22.13
Grass	0.36	high			2.25	4.18	5.79	7.40	9.01	10.62	12.07	13.04
Millet	0.64	high		1.80	3.70	5.86	7.73	9.33	10.94	13.20	14.81	16.58
Grain Sorghum	0.56	high		0.52	4.51	9.66	12.07	13.68	16.90	19.63	22.05	25.27
Forage Sorghum	0.56	high		0.52	4.51	9.66	12.07	13.68	16.90	19.63	22.05	25.27
Chicory	0.54	high	0.93	2.96	4.67	6.57	8.14	10.04	12.12	13.86	15.35	16.72

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator 28 Run AS3500' Sowing Chart Normal

28 Run AS3500

NORMAL SEED (toggle NORMAL, Butterfly Valve Settings shown below and on page 32)

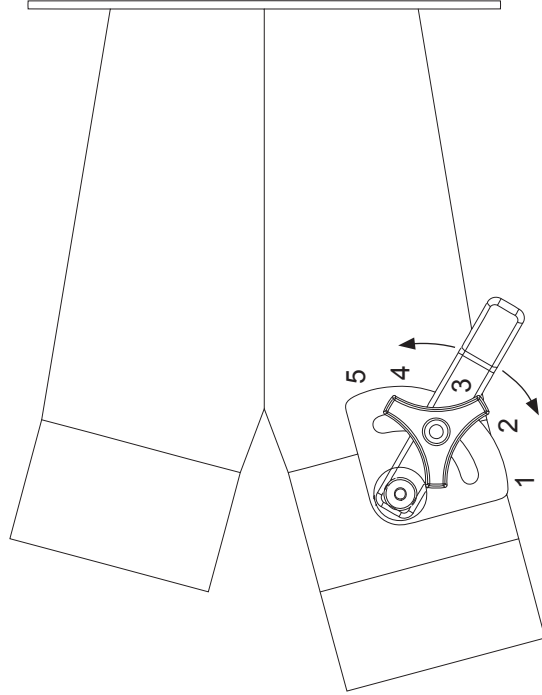
PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
Wheat	0.8	high	28	41	56	70	85	99	114	128	141	156	171	185	200	215	228	242	257	272	286	301	314
Oats	0.5	high	20	28	38	48	58	67	76	86	96	106	115	124	134	144	154	163	172	182	192	202	211
Barley	0.7	high	26	39	52	64	77	90	103	116	129	141	154	167	180	193	206	218	231	244	257	270	283
Ryecom	0.7	high	27	40	54	67	81	95	109	123	137	150	163	176	191	205	219	232	245	259	274	288	301
Peas	0.8	high	17	33	48	63	79	95	111	126	141	158	173	189	204	219	235	251	267	282	297	313	328
Grass	0.4	high		15	21	28	34	41															
Pasture Mix	-	high		15	21	28	34	41															
DAP	1.0	high	32	47	63	79	94	110	126	141	157	173	189	204	219	236	251	267	283	298	314	330	345
Superphosphate	1.3	high	28	57	89	112	139	166	191	216	246	273	297	317	342	366	397	426	453	476	505	536	

INCREASED ACCURACY FOR SETTING POSITION<25mm (toggle NORMAL, Butterfly Valve Settings shown below and on page 24)

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position> RATE*	*10*	*15*	*20*	*25*	30
Wheat	0.8	low	13.8	20.7	28.0	34.9	42.3
Oats	0.5	low	9.8	14.2	19.1	24.0	28.8
Barley	0.7	low	13	19.5	26	32.1	38.6
Ryecom	0.7	low	13.4	19.9	26.8	33.7	40.6
Peas	0.8	low	8.5	16.3	24.0	31.7	39.4
Grass	0.4	low	-	7.3	10.6	13.8	17.1
Pasture Mix	-	low	-	7.3	10.6	13.8	17.1

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed - 2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

*MAXIMUM PERMISSABLE SPEED 4000 RPM



'Renovator 28 Run AS3500' Sowing Chart Fine

FINE SEED (toggle 'FINE', Butterfly Valve Settings shown below and on page 32)

28R AS3500

PRODUCT	SPECIFIC GRAVITY (kg/l)	Setting Position>	2.5	5	7.5	10	12.5	15	17.5	20	22.5	25
			RATE ONCE SET DO NOT REDUCE/CLOSE WITH SEED IN BIN**									
Lucerne (Alfalfa)	0.77	low	0.89	2.49	3.74	5.27	6.44	7.59	9.17	10.52	11.69	12.59
Turnip	0.65	low	0.89	1.87	2.76	3.70	4.63	5.57	6.46	7.39	8.33	9.26
Kale	0.65	low	0.89	1.87	2.76	3.70	4.63	5.57	6.46	7.39	8.33	9.26
Swedes	0.65	low	0.89	1.87	2.76	3.70	4.63	5.57	6.46	7.39	8.33	9.26
Canola/Rape	0.65	low	0.89	1.87	2.76	3.70	4.63	5.57	6.46	7.39	8.33	9.26
White Clover	0.77	low	0.93	2.15	3.49	4.88	6.22	7.31	8.65	9.75	10.81	11.17
Red Clover	0.77	low	0.93	2.15	3.49	4.88	6.22	7.31	8.65	9.75	10.81	11.17
Grass	0.36	low			1.14	2.11	2.93	3.74	4.55	5.36	6.09	6.58
Millet	0.64	low		0.91	1.87	2.96	3.90	4.71	5.53	6.66	7.48	8.37
Grain Sorghum	0.56	low		0.26	2.28	4.88	6.09	6.91	8.53	9.91	11.13	12.76
Forage Sorghum	0.56	low		0.26	2.28	4.88	6.09	6.91	8.53	9.91	11.13	12.76
Chicory	0.54	low	0.47	1.50	2.36	3.32	4.11	5.07	6.12	7.00	7.75	8.44
Lucerne (Alfalfa)	0.77	high	1.79	4.97	7.48	10.55	12.89	15.18	18.33	21.04	23.38	25.19
Turnip	0.65	high	1.79	3.74	5.53	7.39	9.26	11.13	12.92	14.79	16.66	18.53
Kale	0.65	high	1.79	3.74	5.53	7.39	9.26	11.13	12.92	14.79	16.66	18.53
Swedes	0.65	high	1.79	3.74	5.53	7.39	9.26	11.13	12.92	14.79	16.66	18.53
Canola/Rape	0.65	high	1.79	3.74	5.53	7.39	9.26	11.13	12.92	14.79	16.66	18.53
White Clover	0.77	high	1.87	4.31	6.99	9.75	12.43	14.63	17.31	19.50	21.61	22.34
Red Clover	0.77	high	1.87	4.31	6.99	9.75	12.43	14.63	17.31	19.50	21.61	22.34
Grass	0.36	high			2.28	4.23	5.85	7.48	9.10	10.73	12.19	13.16
Millet	0.64	high		1.82	3.74	5.92	7.80	9.43	11.05	13.33	14.95	16.74
Grain Sorghum	0.56	high		0.52	4.55	9.75	12.19	13.81	17.06	19.82	22.26	25.51
Forage Sorghum	0.56	high		0.52	4.55	9.75	12.19	13.81	17.06	19.82	22.26	25.51
Chicory	0.54	high	0.94	2.99	4.71	6.63	8.22	10.14	12.24	13.99	15.50	16.88

**Setting may only be reduced by a large amount if unit is turning or bin and metering device clear of product else damage will occur. Do not open the setting above '25' with the toggle set to 'fine' as the adjuster will break.

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

'Renovator AS3000/3500' Airflow & Fan Speed

Airflow and Fan Settings

1. Hydraulic Fan -connect the hoses in the following order:

First - connect Zero pressure Case Drain 3/8" hose (1/2" BSP Female QR) to hydraulic reservoir *



Second -connect Motor Return 3/4" hose (3/4" BSP Female QR) to tractor high flow low pressure return port.

Finally - connect High Pressure Motor Feed 1/2" hose (1/2" BSP Male QR) to tractor remote.

Disconnect in the reverse order to prevent motor seal damage.

*The tractor hydraulic reservoir or free drain connection must have zero backpressure.

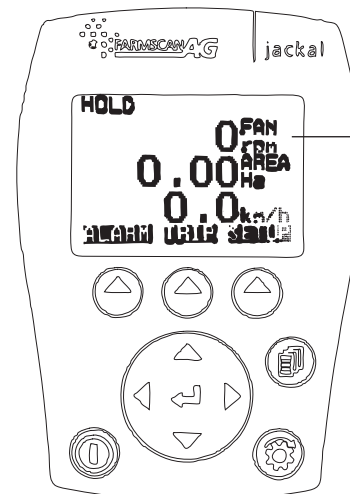
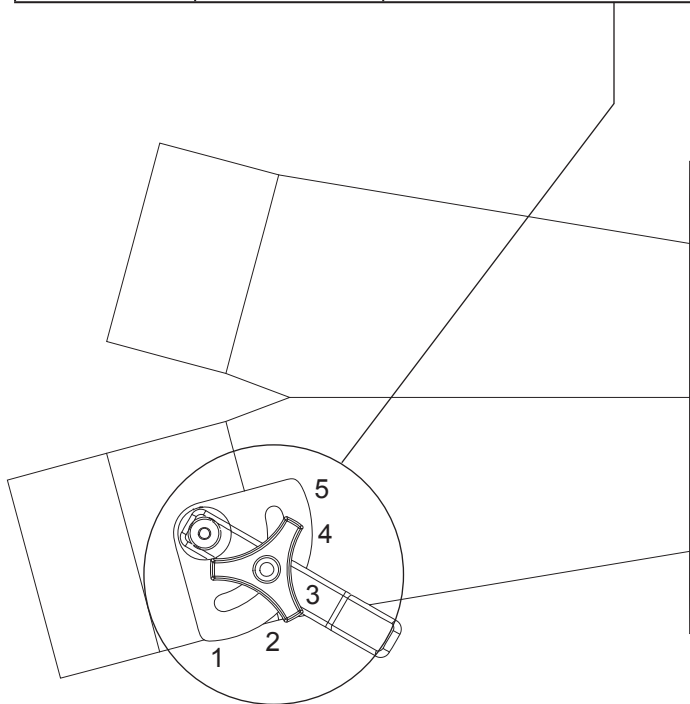


2. A higher fan speed is usually required to correctly deliver high rate or heavier product such as fertilizer from the front box. The airflow to the rear box is reduced by setting the butterfly valve to the appropriate position as shown in the table. If this is not done the seed delivered to the disc units from the rear box may well bounce out of the seed slot.

The following table shows box fill combinations, butterfly position and recommended fan speeds for normal/fine seeds and fertilizer:-

Box contents		Butterfly Position (affects rear box)	Fan Speed/rpm*
FRONT	REAR		
seed (Normal)	seed (Normal)	open - 5	3000
seed (Normal)	seed (Fine)	closed - 1	3000
Fertilizer	seed (Normal)	closed -2	3000 to 3500
Fertilizer	seed (Fine)	closed - 1	3000 to 3500

* MAXIMUM PERMISSIBLE FAN SPEED 4000 RPM



The Fan Speed shown on the Farmscan Jackal is for illustrative purposes only. Refer to the table for the correct setting.

'Renovator AS3000/3500' Operation

Operation

General Operation Guidelines

- 1 Hydraulic Fan -connect the hoses in the following order:

First - connect Zero pressure Case Drain 3/8" hose (1/2" BSP Female QR) to hydraulic reservoir *



Second -connect Motor Return 3/4" hose (3/4" BSP Female QR) to tractor high flow low pressure return port.

Finally - connect High Pressure Motor feed 1/2" hose (1/2" BSP Male QR) to tractor remote.

Disconnect in the reverse order to prevent motor seal damage.

- *The tractor hydraulic reservoir or free drain connection must have zero backpressure.



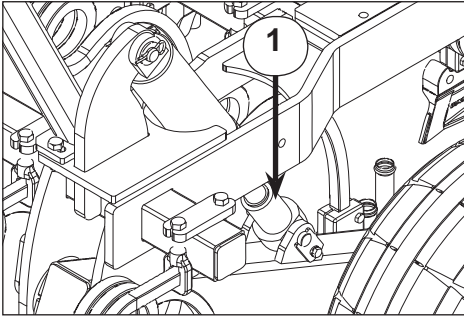
- 2 Use a sufficiently powerful tractor which is heavy enough to tow the drill safely.
- 3 Operate the drill at a speed of 6-12 km/hr (4-8 mph).
In stony and uneven ground conditions a lower speed is more appropriate
- 4 Check that the drill is level during calibration and while seeding.
- 5 Check tyre pressure before seeding. Refer page 5.
- 6 Double check seed rates before seeding.
- 7 Raise the drill out of the ground when making any turns.
- 8 Raise the drill out of the ground before backing up.
- 9 After prolonged storage, check to see that all drive mechanisms and hydraulic equipment are functioning correctly. Check that the seed tubes are not perished or blocked.

Sowing Speed

Typical travel speeds when sowing range from 6-12 km/hr in good conditions. In stoney and uneven ground conditions a lower speed is recommended to minimise rapid part deterioration. Sowing too fast can result in:

- 1 Poor contour following and uneven sowing depth.
- 2 Impact damage to:
 - a Ground engaging components.
 - b Bearings, housings & axles.
 - c Fasteners & structural components.
- 3 More extreme conditions will result in greater vibration and uneven seed flow at low seeding rates.

'Renovator AS3000/3500' General Operation



Sowing Depth Control

The sowing depth is dependent on:

- 1 The wheel height in relation to the chassis
- 2 Tyre pressure
- 3 Ground condition i.e. hard or soft

The wheel height in relation to the chassis is controlled using the threaded depth adjustment collars on the wheel leg rams.

Level Drill

Use the drawbar turnbuckle or ram to tilt the drill so it is sitting level. An adjustment may be required after a short period of use because the paint wears off the discs and the discs sharpen which in turn improves the penetration abilities. Ensure that the front and rear rows are at an even depth.

Transport Position

When in the transport position the hydraulic cylinders are fully extended. In this position the cylinders fully equalise by allowing oil to bypass the master cylinder piston. It is recommended to raise the drill into the transport position when turning at headlands or regularly to counteract the effects of oil leakage past the piston and ensure cylinder rods are equally extended and minimise variations in sowing depth.

'Renovator AS3000/3500' Jackal Areameter

Farmscan Jackal v3.5 Settings Setup

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

Farmscan Jackal v3.5 Factory Setup for Enviro DD30 Air

Refer to the Farmscan Jackal v3.5 manual.

Input 1 - Three wire proximity sensor for 'Area/Speed Wheel' measurement taken from shaft on drive pedestal.

The white 'signal' lead is connected to input A1.

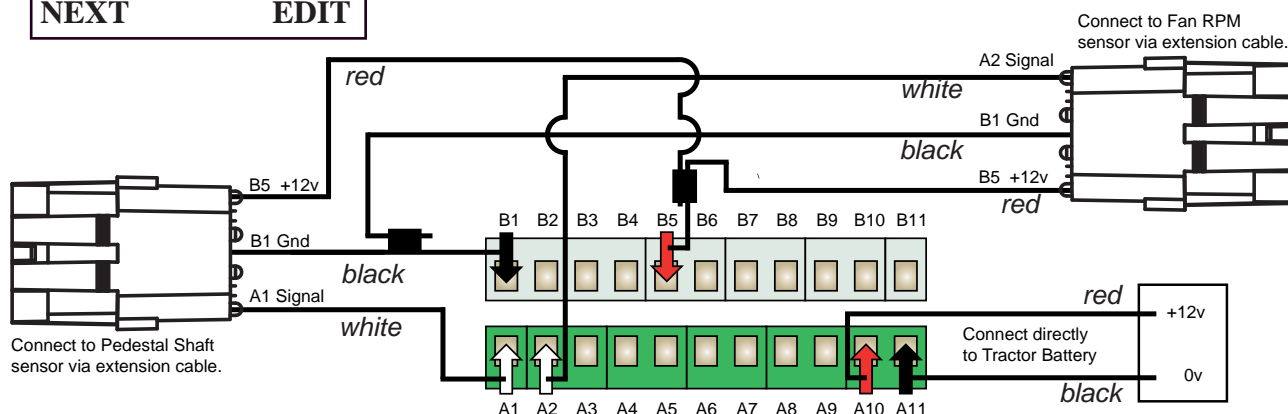
Input 1 Edit	
m/pulse	
Auto Set:	
Target:0.000m	
Meas.pulses:	0
Manual Ratio:	
	2.750000
NEXT	EDIT

Other Settings	
Implement Width:	3.000 m
Extern.Run/Hold:	Disabled
Alarm Beep:2	
NEXT	EDIT

Machine Size	Row Spacing (mm)	Sowing Width (m)
16 Run	178	2.848
20 Run	178	3.560
21 Run	147.5	3.098
24 Run	147.5	3.540
24 Run	125	3.000
28 Run	125	3.500

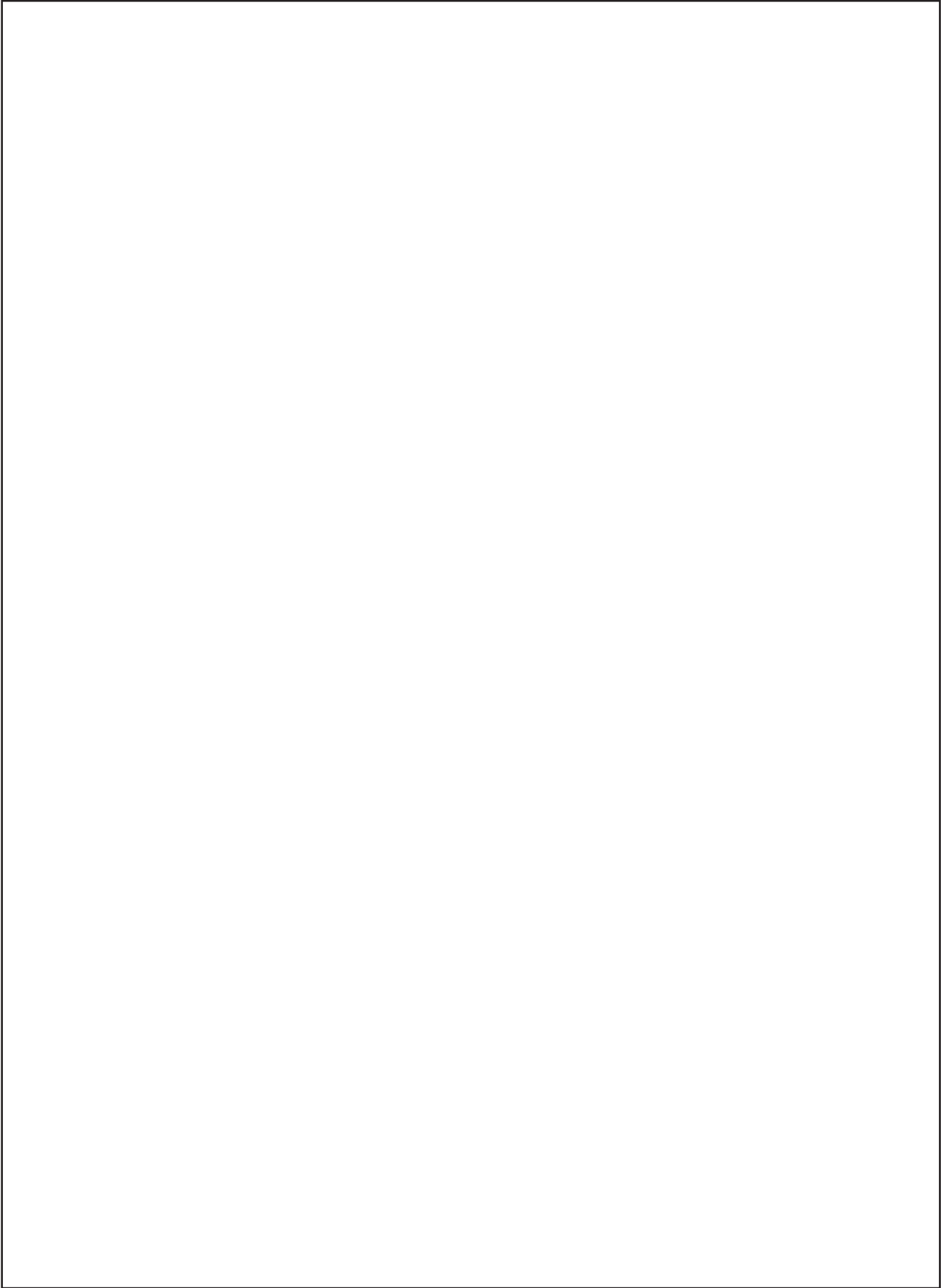
Input 2 - Three wire proximity sensor for fan 'Tachometer' measurement. The white 'signal' lead is connected to input A2.

Input 2 Edit	
pulse/rev	
Auto Set:	
Target:0.000rev	
Meas.pulses:	0
Manual Ratio:	
	1.000000
NEXT	EDIT



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.



'Renovator AS3000/3500' Maintenance & Care

Maintenance & Care

General Safety and Accident Prevention Advice



- 1 Make sure that if the tractor remains attached to the drill 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 Wear gloves when handling components with cutting edges such as worn discs etc.
- 4 Disconnect the electrical supply from the tractor before doing any electrical maintenance.
- 5 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/poppet valve 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.

'Renovator AS3000/3500' Maintenance & Care

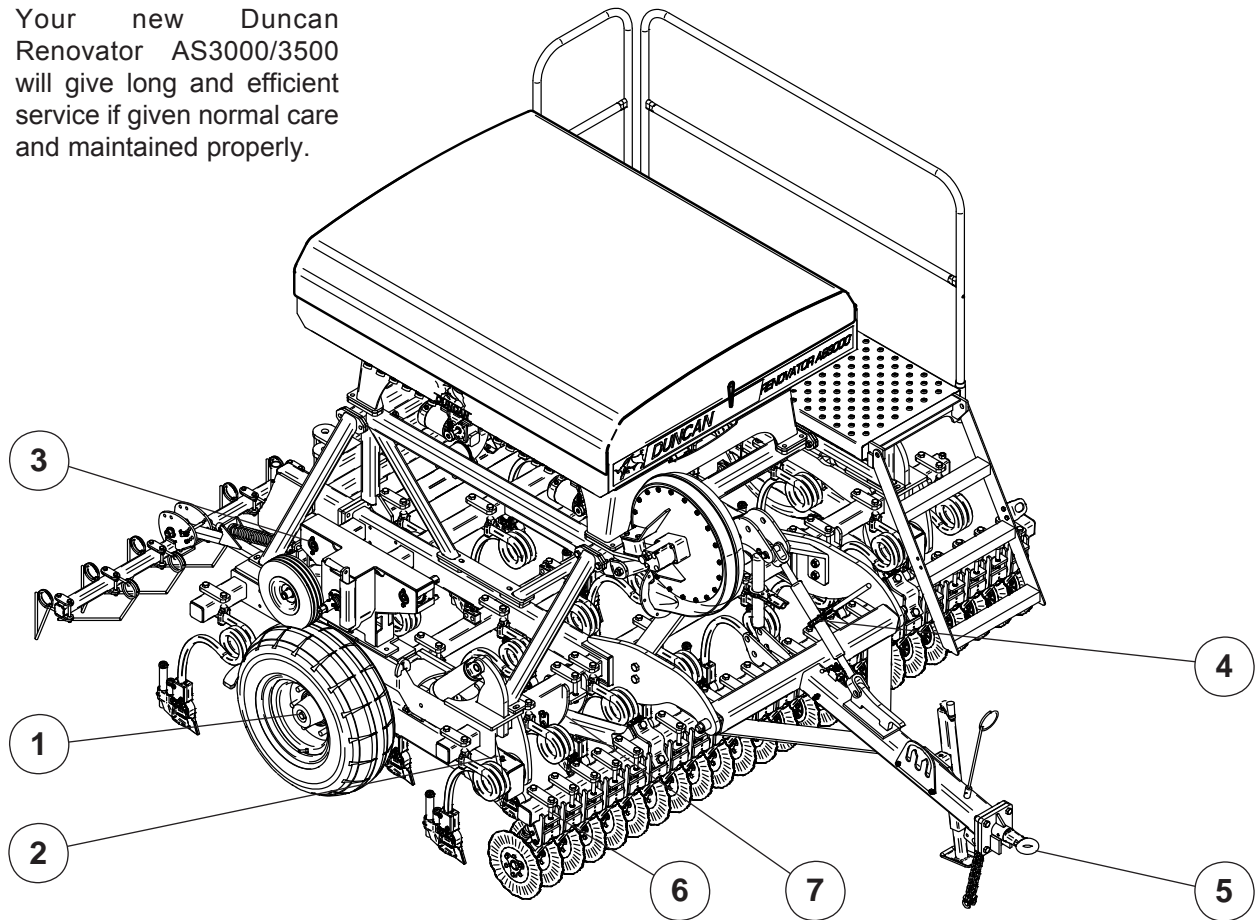
Maintenance & Care - Lubrication Instructions

Precautions with Grease

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



Your new Duncan Renovator AS3000/3500 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	Wheel Leg Pivots	Castrol LMX Grease	Weekly
3	Drive Chains	Suitable Roller Chain Lubricant	See Maintenance Schedule
4	Turnbuckle	Castrol LMX Grease	Monthly
5	Coupling	Castrol LMX Grease	Weekly
6	Disc Arm Castings	Castrol LMX Grease	Daily
7	Disc Opener Fr. Pivots	Castrol LMX Grease	Monthly

* The lubrication frequencies are only a guide. Actual frequency will be dependent on extent of use and ground conditions.

'Renovator AS3000/3500' Maintenance & Care

Maintenance & Care - Lubrication Instructions

Components	Daily (or after 20Ha)	Weekly (or after 75Ha)	Pre Season (or 500 Ha)
Disc Openers (if fitted)	•	•	•
Depth Adjustment Collar	•	•	•
Wheel Nuts	•	•	•
Pivot Pin Fasteners		•	•
Coupling & Safety Chains		•	•
Roller Chains		•	•
Hydraulics (Oil Leaks)		•	•
Tyre Pressures		•	•
Bolted Connections			•

Maintenance Schedule

(Refer also to Summary Chart, above)

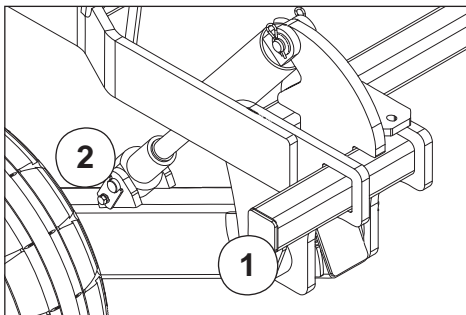
1. Bolted Connections

All bolted connections of the machine should be checked after the first 3 to 5 hours of operation and retightened if necessary and thereafter at regular intervals. It is suggested that this is done every 500 hectares or annually, whichever occurs first.

2. Drive Chains

All drive chains should first be checked after every 20 hours of operation and thereafter weekly or after 75Ha of operation as follows:-

The metering units of the seed drill are driven via driveshafts and roller chains from the drive wheel. 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 or oil or spray them with a suitable commercial roller chain lubricant. Do not heat the black plastic chain tensioners; just wash in kerosene and refit. The lubricant on the chain will transfer to the tensioner in use.



4. Wheel Arm Pivots

Wheel arm pivots must be greased regularly (weekly or after every 75Ha) to provide lubrication and flush out any dirt. (1).

5. Depth Adjustment Collar

Grease the depth adjustment collar (2) regularly to ensure it does not seize up. Also check for dirt buildup around the ram shaft seals to ensure seal damage does not occur. Refer Fig 26

'Renovator AS3000/3500' Maintenance & Care

Maintenance Schedule (continued)

6. Tyre Pressure

The recommended tyre pressure is listed on Page 5. Weekly checks are recommended.

7. Disc Openers

Front coulter bearings are sealed and do not require lubrication. Check discs for any lateral movement (wobble) on a regular basis. Replace bearings if there any noticeable wobble.

There is one grease nipple on each disc opener frame pivot and disc assembly casting. Frame pivots should be greased monthly while disc castings should be greased daily to provide lubrication and to flush out any dirt.

8. Framework

The framework structure should be inspected annually for defects, i.e., cracks in members or welded connections. The framework should be cleaned prior to the inspection.

9. Metering Units

Ensure that the metering units are clean and that the rubber sealing lip is not damaged. The sealing lip is located along the base of the trap door hinge. A damaged sealing lip can cause seed delivery problems.

10. Fan Hydraulic Motor

Hydraulic Fan -connect the hoses in the following order:

First - connect Zero pressure Case Drain 3/8" hose (1/2" BSP Female QR) to hydraulic reservoir *

Second -connect Motor Return 3/4" hose (3/4" BSP Female QR) to tractor high flow low pressure return port.

Finally - connect High Pressure Motor Feed 1/2" hose (1/2" BSP Male QR) to tractor remote.

Disconnect in the reverse order to prevent motor seal damage.

*The tractor hydraulic reservoir or free drain connection must have zero backpressure.

'Renovator AS3000/3500' Maintenance & Care

Maintenance & Care (Continued)

Preparing the Machine for Storage.

Locate on a dry level surface. The machine should be stored wherever possible so the rams are not supporting any weight. The drive chains should be lubricated with suitable roller chain lubricant before prolonged periods of storage.

It is recommended that maintenance be carried out at the end of the season, giving sufficient time to obtain spare parts and/or carry out repairs if required.

The seed and fertilizer bins must be completely emptied and cleaned

Leave the metering unit trap doors open.

Fit the cover to the bin.

'Renovator AS3000/3500' Troubleshooting

Problem	Possible Cause	Action	Refer to Page...
Over Sowing	Jockey wheel under inflated	<i>Check pressure</i>	5
	Are the Jackal meter settings correct?	<i>Check settings</i>	25
	Has the setup/calibration procedure been followed correctly?	<i>Check setup and recalibrate</i>	20
	Gearwheel position incorrect	<i>Check setup for seed type</i>	20
	Crank handle turned too quickly when calibrating	<i>Only 1.5 seconds per revolution</i>	21
Under Sowing	Has the setup/calibration procedure been followed correctly?	<i>Check setup and recalibrate</i>	20
	Gearwheel position incorrect	<i>Check setup for seed type</i>	20
	Are the calibration scales in kg (not lbs)?	<i>Check scales</i>	-
	Sowing at shallow depths. Is there sufficient pressure on the jockey wheel?	<i>Check and adjust spring pressure</i>	-
	Metering unit is clogged	<i>Clean metering unit</i>	-
Cracking noises coming from the metering unit	Very large seed	<i>Remove roll pins from agitator shaft</i>	
Drill sowing deeper on one side/leaking down on one side	Hydraulic lift rams have not rephased properly	<i>Rephase rams</i>	36
	Dirt in the poppet valve of the ram	<i>Clean/replace valve</i>	
Tines are moving	Too much turning with drill in the ground	<i>Keep turning to minimum</i>	-
Drill not penetrating into ground/drill riding out of ground	Operating the drill in the float position	<i>Do not operate in float</i>	-
	Disc openers are keeping the drill from penetrating into the ground	<i>Lift discs out of the ground</i>	-

'Renovator AS3000/3500' Phasing Cylinders

Commisioning Phasing Cylinders

1. General

(a) The cylinders will re-phase in both directions. Each piston is fitted with 2 poppet valves which open at the end of the stroke to allow oil to bypass the piston. The bypass of oil at the end of the stroke allows for initial bleeding of the system and re-phasing in operation.

(b) The valve in the piston is a precision device, **CLEANLINESS IS OF THE UTMOST IMPORTANCE.** Contamination in the oil will accelerate deterioration of the valve seat. Cylinders will creep once the integrity of the seating is lost.

2. Bleeding the System

(a) Initial bleeding after connection to the tractor

Purge all air from the system by fully stroking rams in both directions. Allow the oil to flow through the cylinders with the tractor at an idle for a minimum of 2 minutes at each end of the stroke.

(b) Re-phasing after initial bleeding

After initial bleeding the cylinders will only require occasional re-phasing during operation. This is done by extending the rams for about 30 seconds or until all cylinders have reached the end of their stroke.

3. Fault Finding

1. Cylinders creeping during operation

There are two primary causes of this:

- (i) Air in the hydraulic system
- (ii) By passing of the poppet valve.

(a) Check that there is no air in the system. Raise and lower the machine. All cylinders should move instantaneously, any lag indicates that there is air in the system. Other signs of air in the system are hoses vibrating/squealing or the control handle shuddering. Re-bleed the system if necessary.

(b) If there is no sign of air in the system and the cylinders still creep, raise the machine off the depth stop and measure the movement of each cylinder rod.

(c) If both cylinders move at the same rate it is likely to be the control valve/lock out valve that is leaking.

(d) If the slave continues moving after the master cylinder has hit the depth stop it is likely to be the piston in the master cylinder that is bypassing.

(e) If the slave cylinder extends while the master cylinder retracts it is likely to be the piston in the master cylinder that is bypassing.

(f) If the master cylinder does not move but the slave does it is likely to be the piston in the slave cylinder that is bypassing.

(g) If the piston is bypassing it is likely to be contamination in the phasing valve. The cylinder will have to be dismantled, cleaned and fitted with a new poppet valve.

'Renovator AS3000/3500' Phasing Cylinders

Commisioning Phasing Cylinders (continued)

3. Fault Finding (continued)

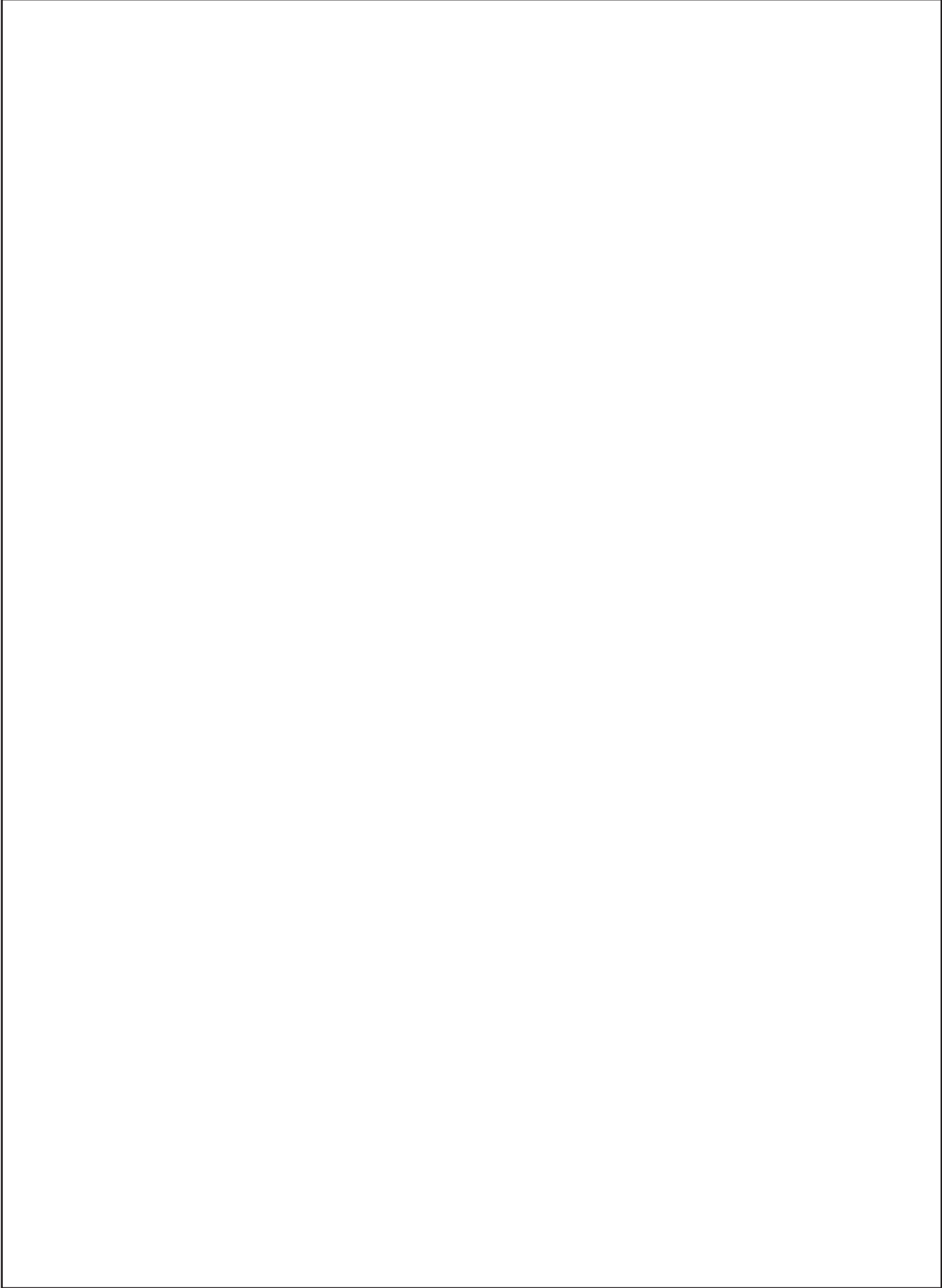
2. Cylinders moving at different rates

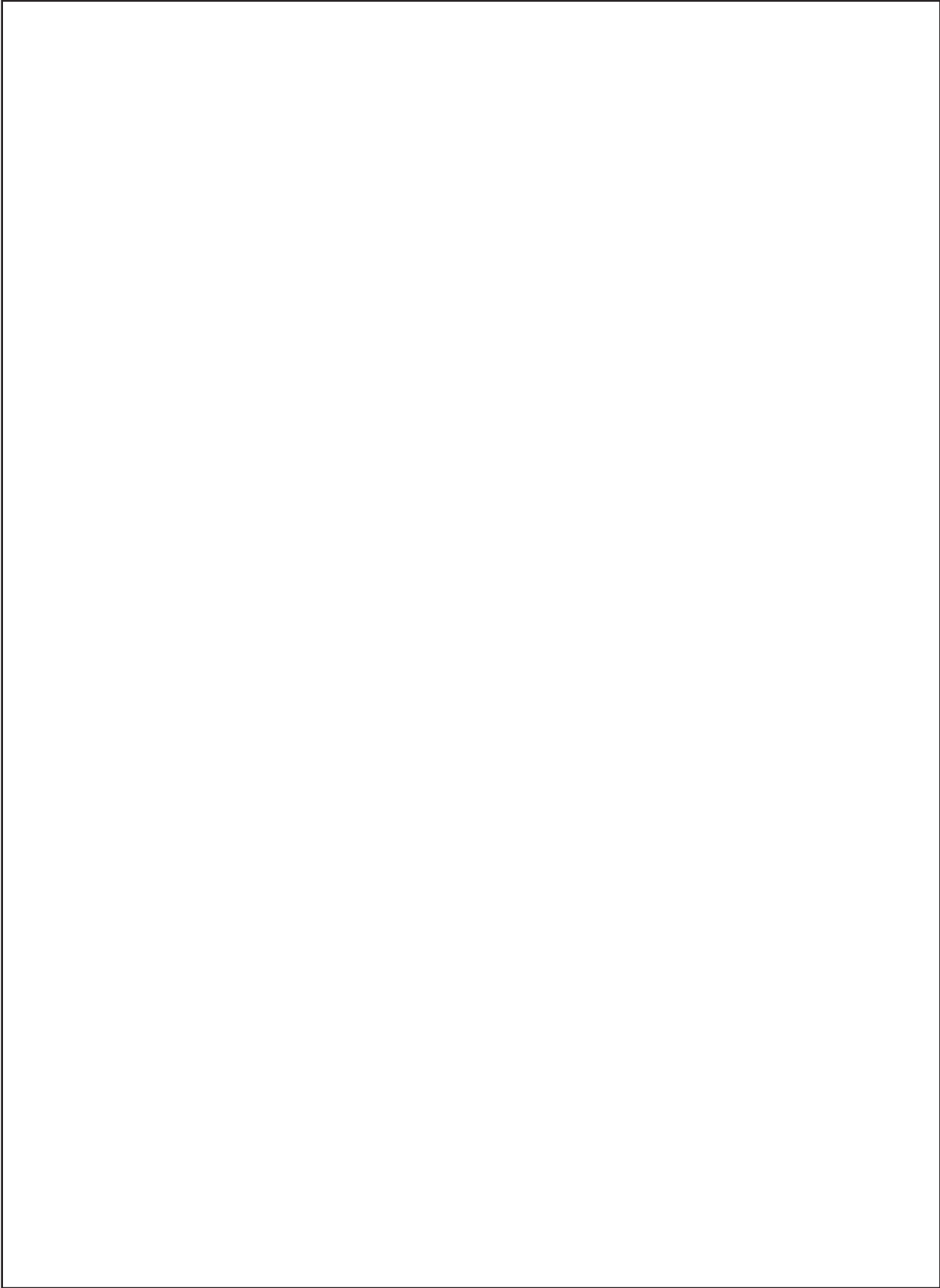
(a) Check that there is no air in the system. Raise and lower the machine; all cylinders should move at the same time, any lag indicates that there is air in the system. Re-bleed the system if necessary.

(b) Ensure that the cylinders have been connected correctly. The cylinders should be connected in series so that the bore sizes go down in 1/4" increments. The Rod end port of the master cylinder (3.5" bore) is connected to the piston end port of the slave cylinder (3.25" bore).

Renovator AS3000/3500 Maintenance Notes

Lined area for taking maintenance notes, consisting of 25 horizontal lines.

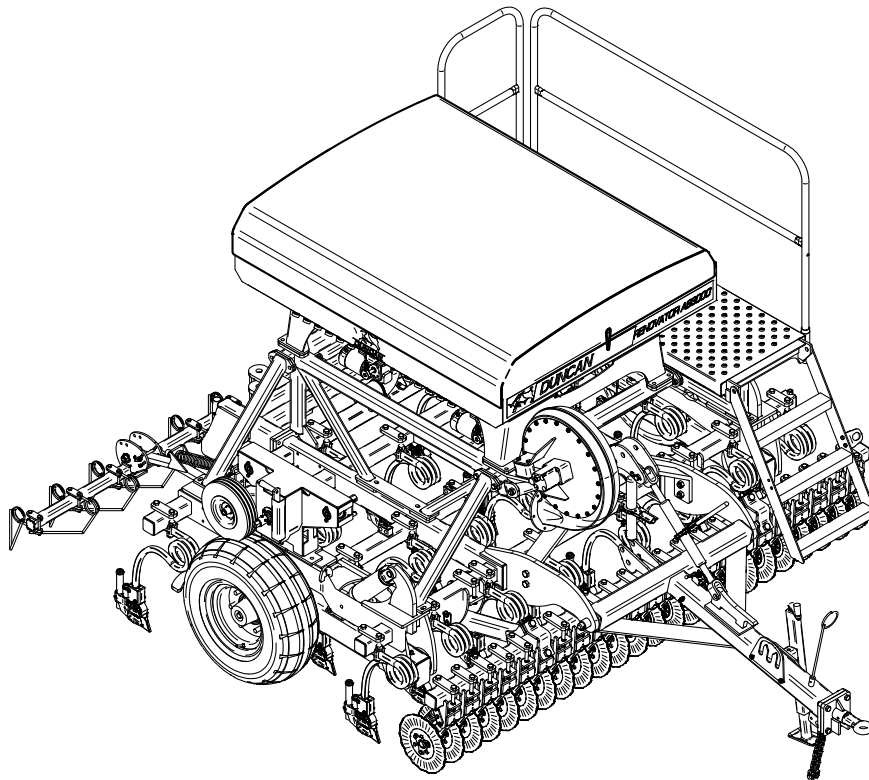




Parts List



'Renovator AS3000' 'Renovator AS3500' Seed Drill



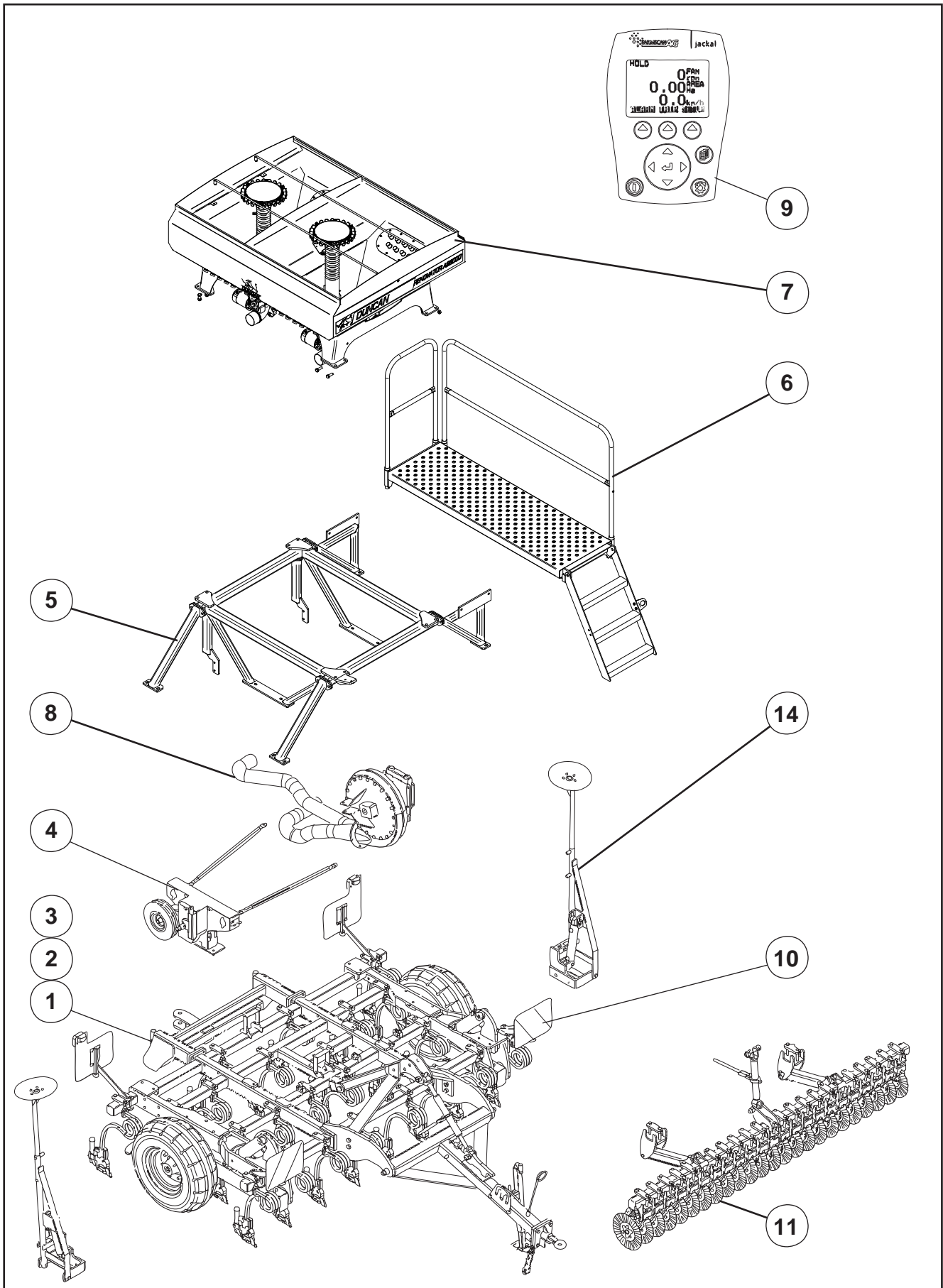
Built to work.

Head Office:
P.O. Box 2018
Hilton Highway, Washdyke
Timaru, New Zealand
Telephone (03) 688 2029
Facsimile (03) 688 2821

Australian Branch:
4B Silverton Close
Laverton North 3026
Melbourne, Australia
Telephone (03) 9314-9666
Facsimile (03) 9314-6810

Pt. No. 67396
Issue 0520

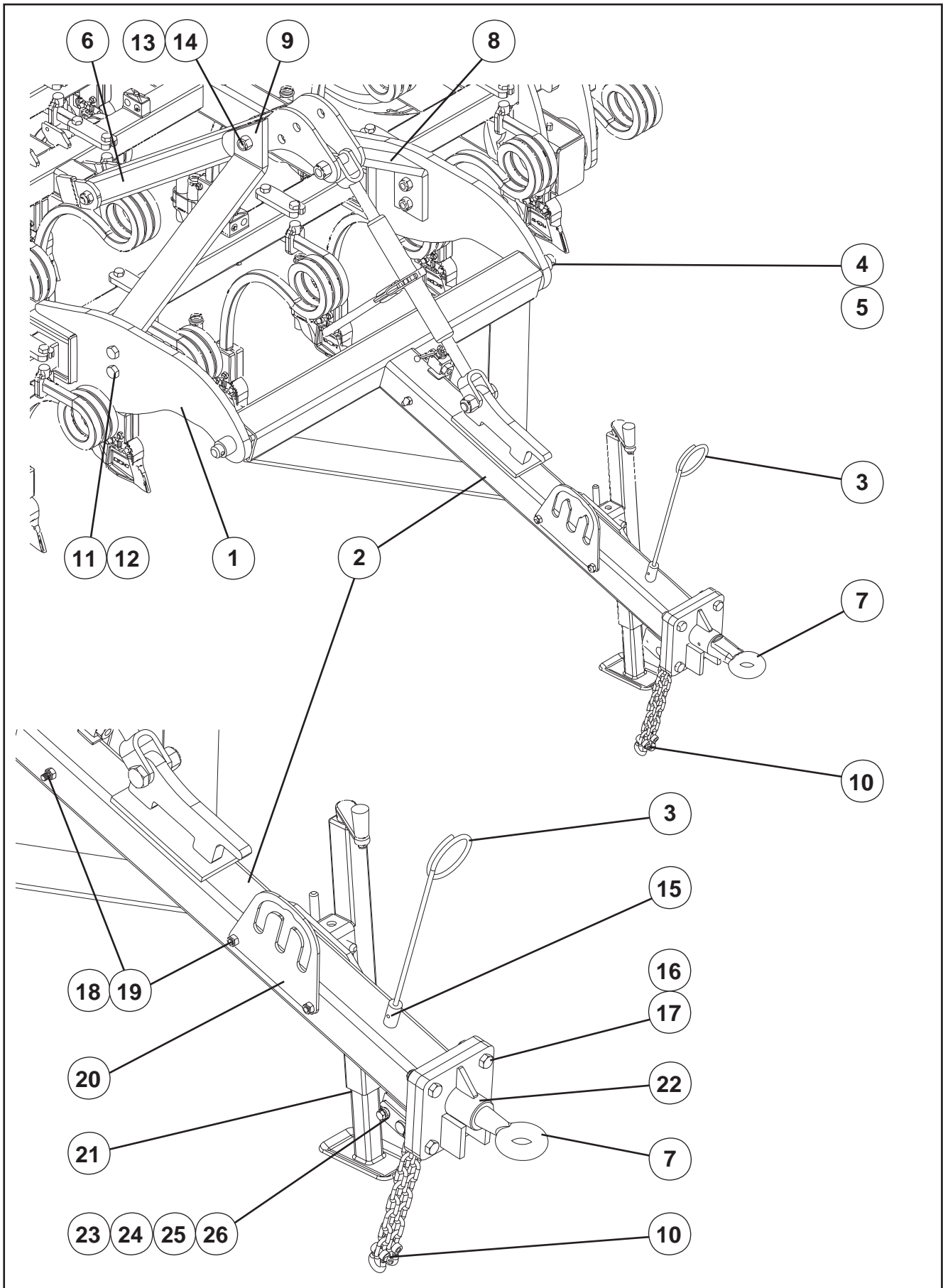
'Renovator AS3000/3500' Complete Assembly



'Renovator AS3000/3500' Complete Assembly

ITEM	PART No.	DESCRIPTION	QTY
1	Refer Page 52-55	Main Frame & Drawbar Assembly	-
2	Refer Page 56	Wheel Leg	2
3	Refer Page 60-61	Tine Assemblies	-
4	Refer Page 62-67	Seed Metering Drive Pedestal	1
5	Refer Page 68-69	Box Mounting Frame	1
6	Refer Page 70-71	Footboard & Ladder	1
7	Refer Page 72-75	Seed Box & Metering Units	1
8	Refer Page 76-77	Fan & Air Hoses	1
9	Refer Page 79	Farmscan Jackal	1
10	Refer Page 80-81	Lighting Kit (Optional)	-
11	Refer Page 82-85	Disc Openers (Optional)	-
12	Refer Page 86-87	Tine Harrows (Optional)	-
13	Refer Page 88-89	Uni-Roller (Optional)	-
14	Refer Page 90-93	Row Markers (Optional)	-

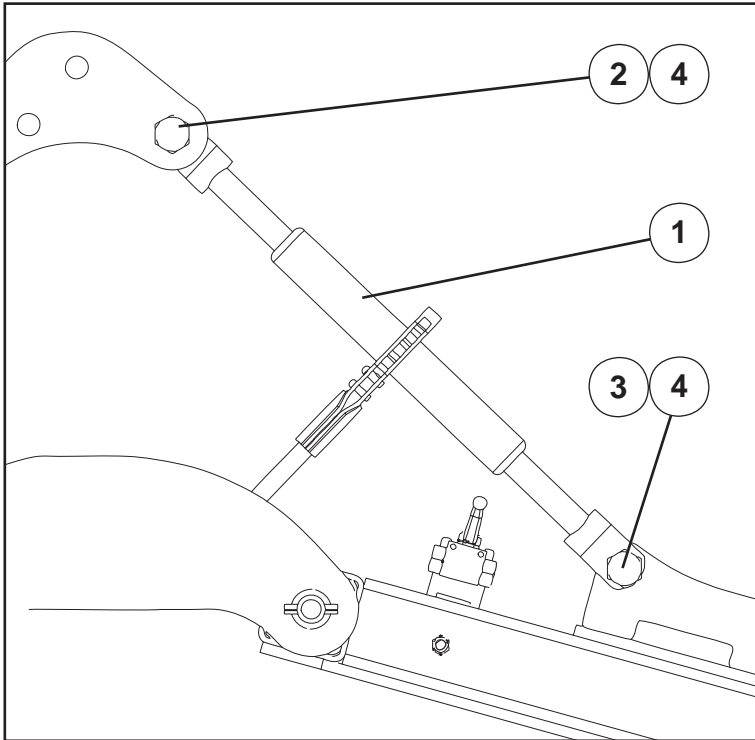
'Renovator AS3000/3500' Mainframe & Drawbar



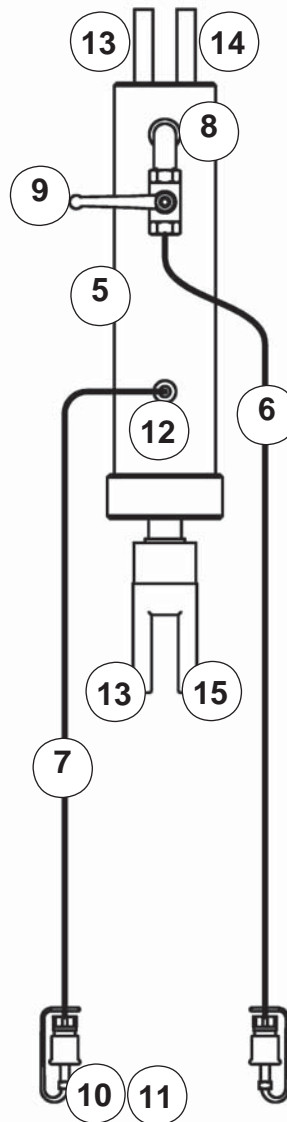
'Renovator AS3000/3500' Mainframe & Drawbar

ITEM	PART No.	DESCRIPTION	QTY
1	60000	3.0m Renovator Mainframe	1
1	60200	3.5m Renovator Mainframe	1
2	60033	Drawbar Welded Assembly	1
3	4800315	Hose Support	1
4	60094	Drawbar Axle	1
5	45285	Roll Pin	2
6	63115	Centre Hitch Welded Assembly	1
7	60405	Towing Eye Assembly	1
8	26577	LH Support Stay	1
9	26578	RH Support Stay	1
10	43832	Safety Chain Assembly	2
11	45066	M20 x 70 Grade 8.8 Bolt	4
12	45141	M20 Nyloc Nut	5
13	45628	7/8" UNF Bolt x 7"	1
14	47548	7/8" UNF Nut	1
15	45181	M8 x 12 S/H Grub Screw	1
16	45042	M16 x 60 Grade 8.8 Bolt	4
17	45140	M16 Nyloc Nut	4
18	45033	M12 x 120 Grade 8.8 Bolt	3
19	45139	M12 Nyloc Nut	3
20	60409P	Hose Rack	1
21	26850k	Stand Kit	1
22	43007	Grease Nipple	1
23	22262	Clevis Pin Tabbed	1
24	45001s	M10 x 20 S/Screw Grade 8.8 ZP	1
25	45152	M10 Light Flat Washer	1
26	45166	M10 Spring Washer	1

'Renovator AS3000/3500' Mainframe & Drawbar



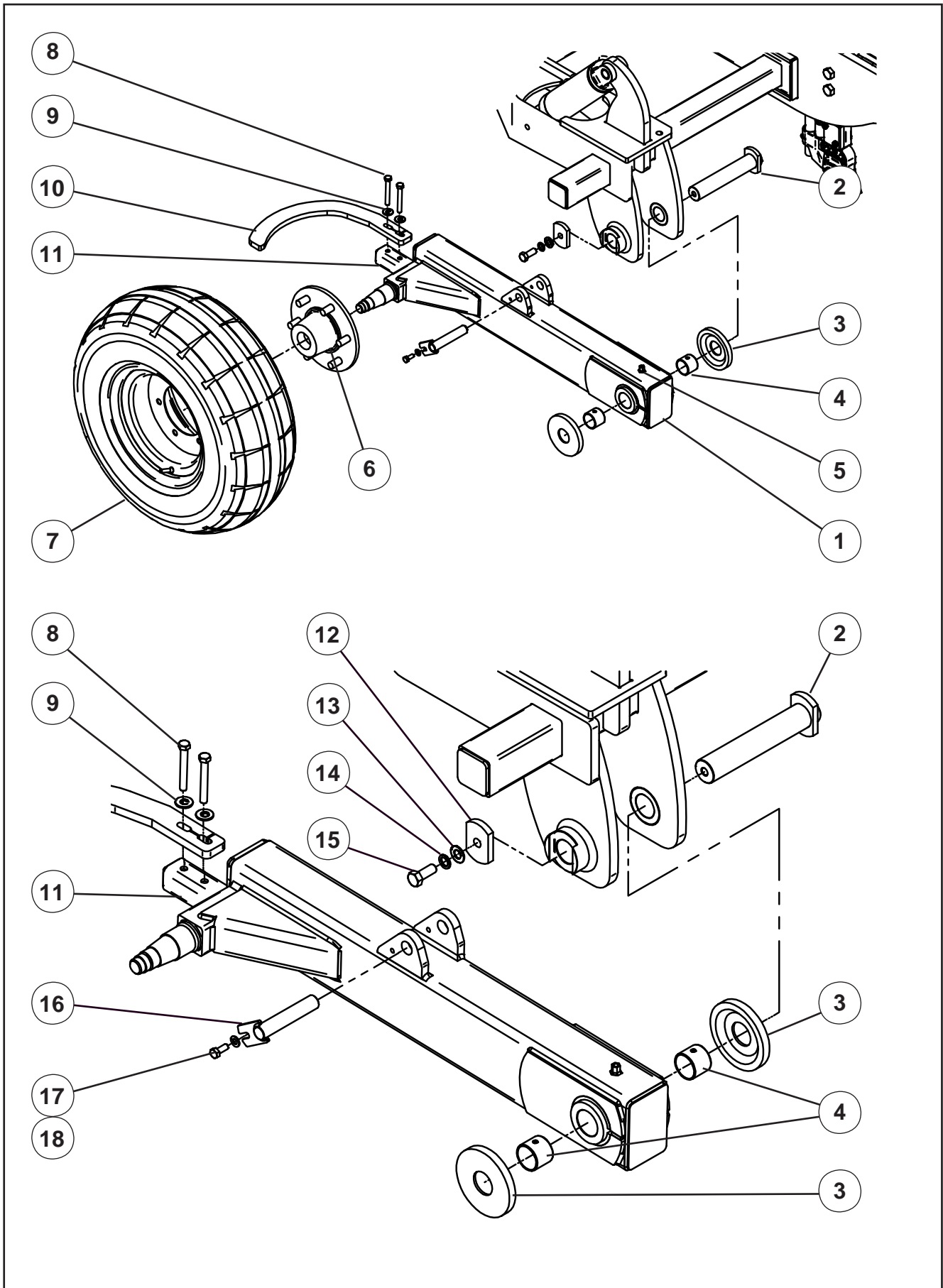
Note: Drawbar hydraulic parts can be purchased as a kit.
The part number is 26720K.



'Renovator AS3000/3500' Mainframe & Drawbar

ITEM	PART No.	DESCRIPTION	QTY
		Drawbar Turnbuckle Parts	
1	43395	H/D Ratchet Turnbuckle	1
2	47254	Bolt 1" UNF x 5" HT	1
3	47251	Bolt 1" UNF x 3.5" HT	1
4	47552	1" UNF Nyloc Nut	2
		Drawbar Hydraulic Parts	
5	43852	Hydraulic Cylinder	1
6	26723	Hydraulic Hose 2.80m	1
7	26724	Hydraulic Hose 2.50m	1
8	43496	3/4" UNO to 3/8"BSPT Elbow	1
9	43393	3/8" BSP S/S Ball Valve	1
10	43147	1/2" BSP Quick Release Coupling	2
11	43617	Dust Cover	2
12	43280	3/4" UNO to 3/8" BSPM Nipple	1
13	47552	1" UNF Nyloc Nut	2
14	47254	Bolt 1" UNF x 5" HT	1
15	47251	Bolt 1" UNF x 3.5" HT	1

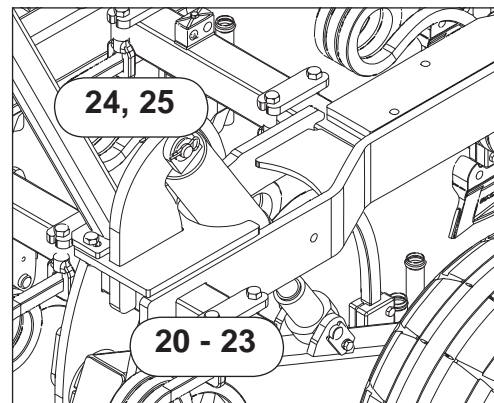
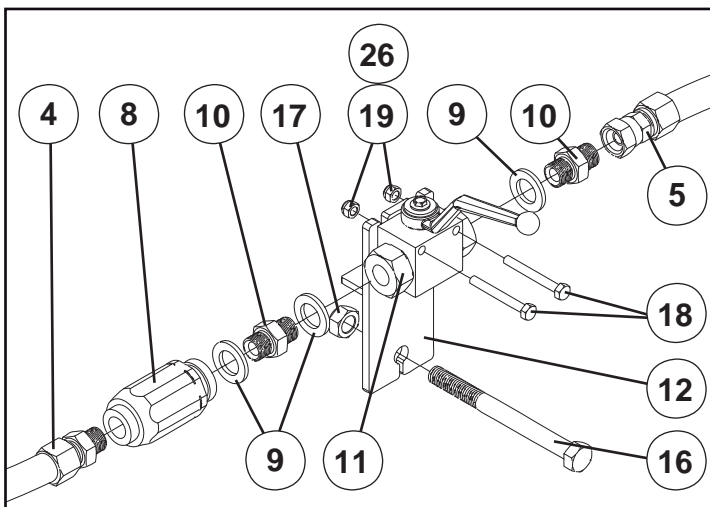
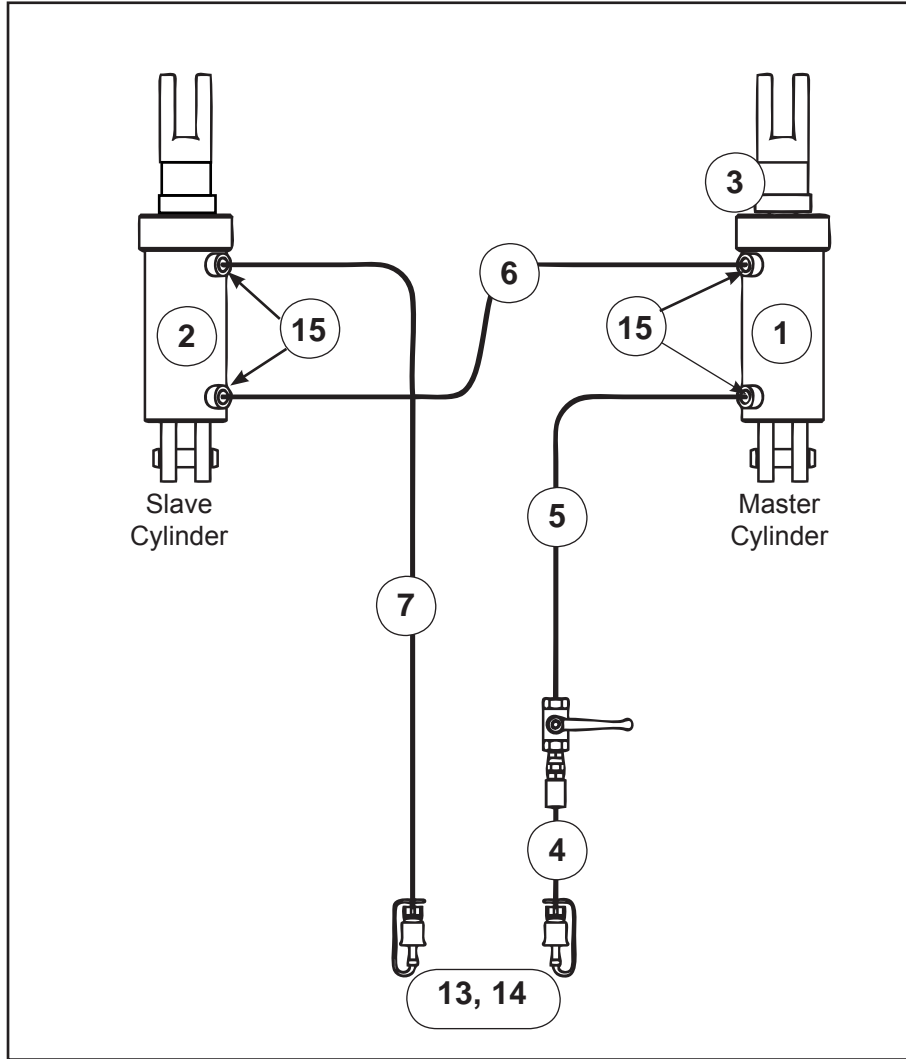
'Renovator AS3000/3500' Wheel Leg



‘Renovator AS3000/3500’ Wheel Leg

ITEM	PART No.	DESCRIPTION	QTY
1	60045PH	Left Hand Wheel Leg (not shown)	1
1	60061PH	Right Hand Wheel Leg	1
2	72332	Pin Whl Leg W/Assy	2
3	60065	Spacer	4
4	43426	Glacier Bush Ø45	4
5	43010	90° Grease Nipple	2
6	60245	Mk4 Ren Hub Only ADR-6 Stud	2
7	45638	10.0/75-15,3 Wheel Assy 6 Stud	2
8	45030	M12 x 90 Gr 8.8 Z/P Bolt	4
9	45159	M12 HD Washer	4
10	60059p	Wheel Scraper	2
11	45139	M12 Nyloc Nut	4
12	72335	Pin Cap Loose Painted	2
13	45154	M16 Light Flat Washer Z/P	2
14	45168	M16 Spring Washer Z/P	2
15	45038s	M16 x 40 Grade 8.8 Z/P S/Screw	2
16	22262`	Clevis Pin Assembly	2
17	45418s	M10 x 25 Set Screw	2
18	45166	M10 Spring Washer	2

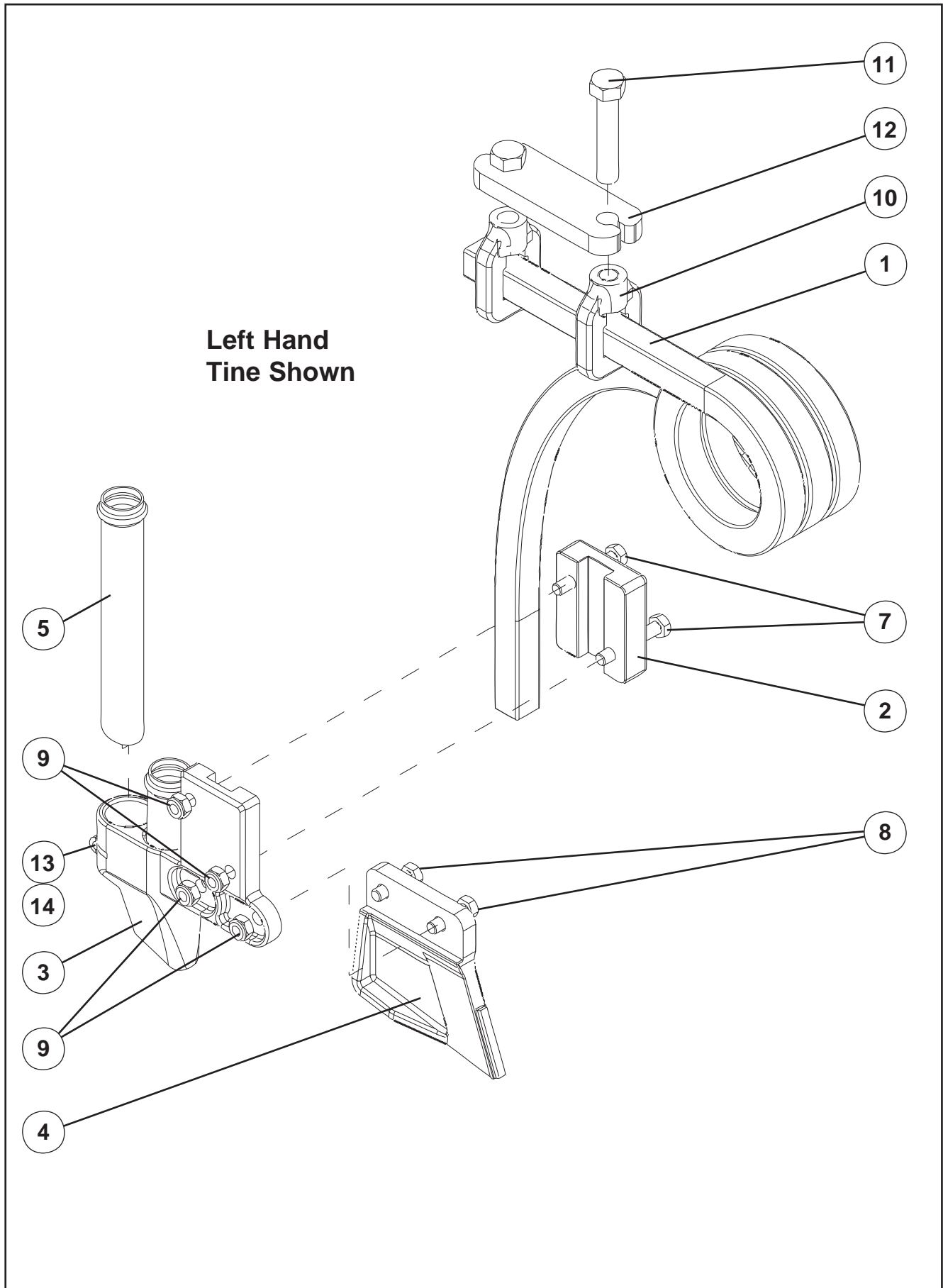
'Renovator AS3000/3500' Wheel Hydraulics



‘Renovator AS3000/3500’ Wheel Hydraulics

ITEM	PART No.	DESCRIPTION	QTY
1	26702	3.5" x 6.5" Master Rephasing Cylinder (Includes pin)	1
2	26703	3.25" x 6.5" Slave Rephasing Cylinder (Includes pin)	1
3	43848	Stroke Limiting Collar 7/8" (where fitted)	1
4	60866	Hydraulic Hose, 2.70m	1
5	60864	Hydraulic Hose, 2.70m	1
6	60864	Hydraulic Hose, 2.70m	1
7	60863	Hydraulic Hose, 5.45m	1
8	43028	3/8" Flow Control	1
9	43391	3/8" Dowty Washer	3
10	43392	3/8" BSPP Male Nipple	2
11	43393	3/8" BSP S/S Ball Valve	1
12	60856	Hydraulic Valve Support Assy	1
13	43147	1/2" BSP Quick Release Coupling	2
14	43617	Dust Cover	2
15	43280	3/4" UNO to 3/8" BSP Nipple	4
16	45033	M12 x 120 Bolt	1
17	45139	M12 Nyloc Nut	1
18	44957	M6 X 50 Bolt	2
19	45136	M6 Nyloc Nut	2
20	22270	Clevis Spacer (spares)	2
21	22262	Clevis Pin Assembly	2
22	45002s	M10 x 25 Set Screw	2
23	45166	M10 Spring Washer	2
24	26558	Clevis Pin (spares)	2
25	45272	R Clip (spares)	2
26	45156	M6 HD Flat Washer	2

'Renovator AS3000/3500' Tine & Boot Assembly

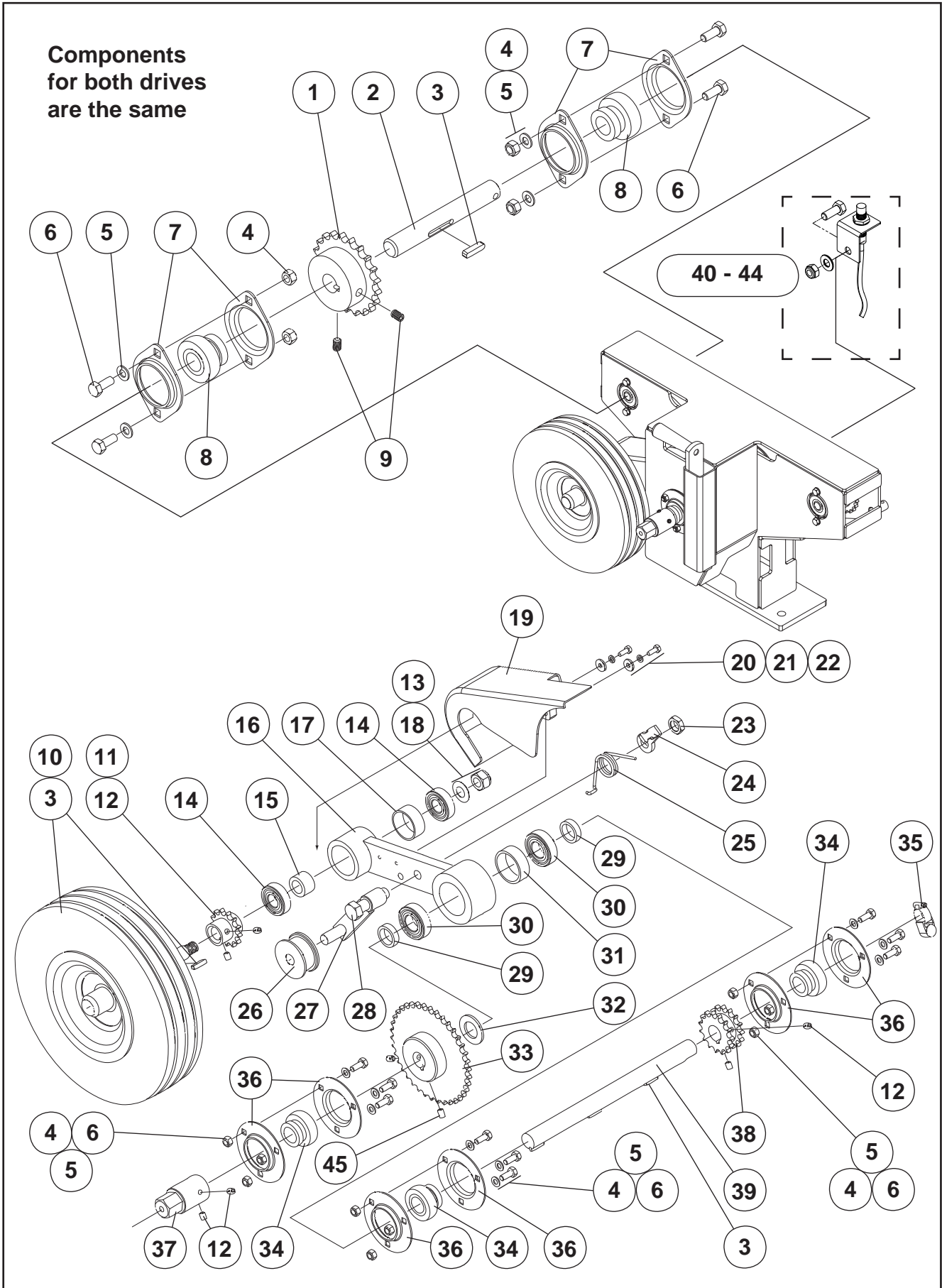


'Renovator AS3000/3500' Tine & Boot Assembly

ITEM	PART No.	DESCRIPTION	3.0m			3.5m		
			16R	21R	24R	20R	24R	28R
1	21413	LH Coil Tine	8	11	12	10	12	14
1	21414	RH Coil Tine	8	10	12	10	12	14
2	26848	LH Inverted Tee Clamp	16	21	24	20	24	28
3	25615	RH Inverted Tee Clamp	16	21	24	20	24	28
4	26849	Cast Inverted Tee Point	16	21	24	20	24	28
5	25608	Fertilizer Tube, Straight	16	21	24	18	22	26
6	25613	Fertilizer Tube, Angle (3.5m only)				2	2	2
7	45010	M10 x 65 Bolt, Class 8.8	32	42	48	40	48	56
8	45003	M10 x 30 Bolt, Class 8.8	32	42	48	40	48	56
9	45138	M10 Nyloc Nut	64	84	96	80	96	112
10	21691	Tine Clamp Casting	32	42	48	40	48	56
11	45046	M16 x 80 Grade 8.8 Z/P Bolt	32	42	48	40	48	56
12	21690	75 x 75 RHS Clamp Plate	16	21	24	20	24	28
13	44963	M8 x 35 Grade 8.8 Z/P Bolt	16	21	24	20	24	28
14	45137	M8 Nyloc Nut	16	21	24	20	24	28
15	43691	Feed Hose 38mm	-					

'Renovator AS3000/3500' Jockey Drive

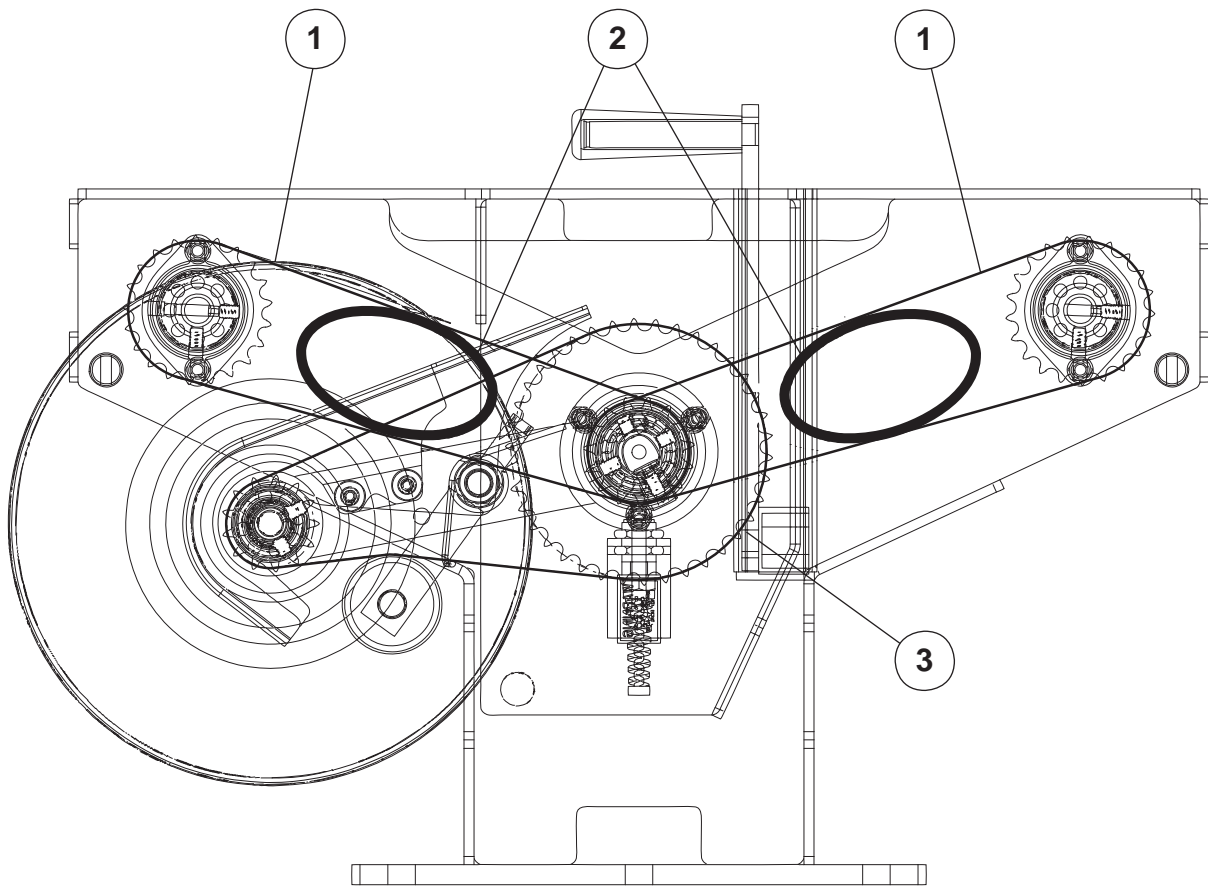
Components
for both drives
are the same



'Renovator AS3000/3500' Seed Drill Jockey

ITEM	PART No.	DESCRIPTION	QTY
1	63128	21T Sprocket 1/2"P 20mm Bore	2
2	25758	Box Drive Shaft	2
3	22294	Sprocket Key (6 x 6 x 25)	6
4	45137	M8 Nyloc Nut	17
5	45151	M8 Light Flat Washer Z/P	17
6	44992s	M8 x 20 Grade 8.8 Z/P S/Screw ...	17
7	43387	Bearing Housing PF47 (1 housing = 2 flanges)	4
8	43385	Bearing YET204 20mm	4
9	45181	M8 x 12 Socket/HD Grub Screw (knurled point)	6
10	25744	Jockey Wheel and Axle W/Assy	1
11	25724	13T Sprocket 1/2"x 20mm Bore	1
12	45180	M8 x 10 Socket/HD Grub Screw (knurled point)	6
13	47625	M16 Bellville Washer S/S304	1
14	17127	Bearing 6204	2
15	25739	Jockey Axle Inner Spacer	1
16	25735	Jockey Wheel Arm W/Assembly	1
17	25727	Jockey Axle Outer Spacer	1
18	45140	M16 Nyloc Nut	1
19	25746	Jockey Drive Swing Guard	1
20	45156	M6 H/D Flat Washer Z/P	2
21	45164	M6 Spring Washer	2
22	44951s	M6 x 16 Grade 8.8 Z/P S/Screw	2
23	45119	M16 Grade 8.8 Hex Half-Nut Z/P	1
24	23376	Chain Tensioner Anchor 30 Ext	1
25	22523	Torsion Spring Right Hand	1
26	22535	Chain Tension Roller	1
27	23373	Chain Tensioner Short L/H Assy	1
28	45043	M16 x 65 Grade 8.8 Z/P Bolt	1
29	25725	Jockey Arm Pivot Spacer	2
30	43939	Bearing 6205	2
31	25729	Jockey Arm Pivot Outer Spacer	1
32	45163	M24 H/D Flat Washer Z/P	1
33	25742	38T Sprocket 1/2" x 25mm Bore	1
34	43386	Bearing YET205 25mm	3
35	44033	Jackal Clamp & Magnet AA-117	1
36	30359	Bearing Housing PF52 (1 housing = 2 flanges)	3
37	22050	Crank Adapter Assembly	1
38	63127	15T Double Sprocket 1/2"P 25mm	1
39	63126	Drive Pedestal Main Shaft	1
40	72913	Sensor Mounting bracket	1
41	44035	Proximity Sensor - Blue AA2010P	1
42	45002s	M10 x 25 Grade 8.8 Z/P S/Screw	1
43	45152	M10 Light Flat Washer Z/P	1
44	45138	M10 Nyloc Nut	1
45	45186	M10 x 12 SKT HD Grubscrew (knurled point)	2

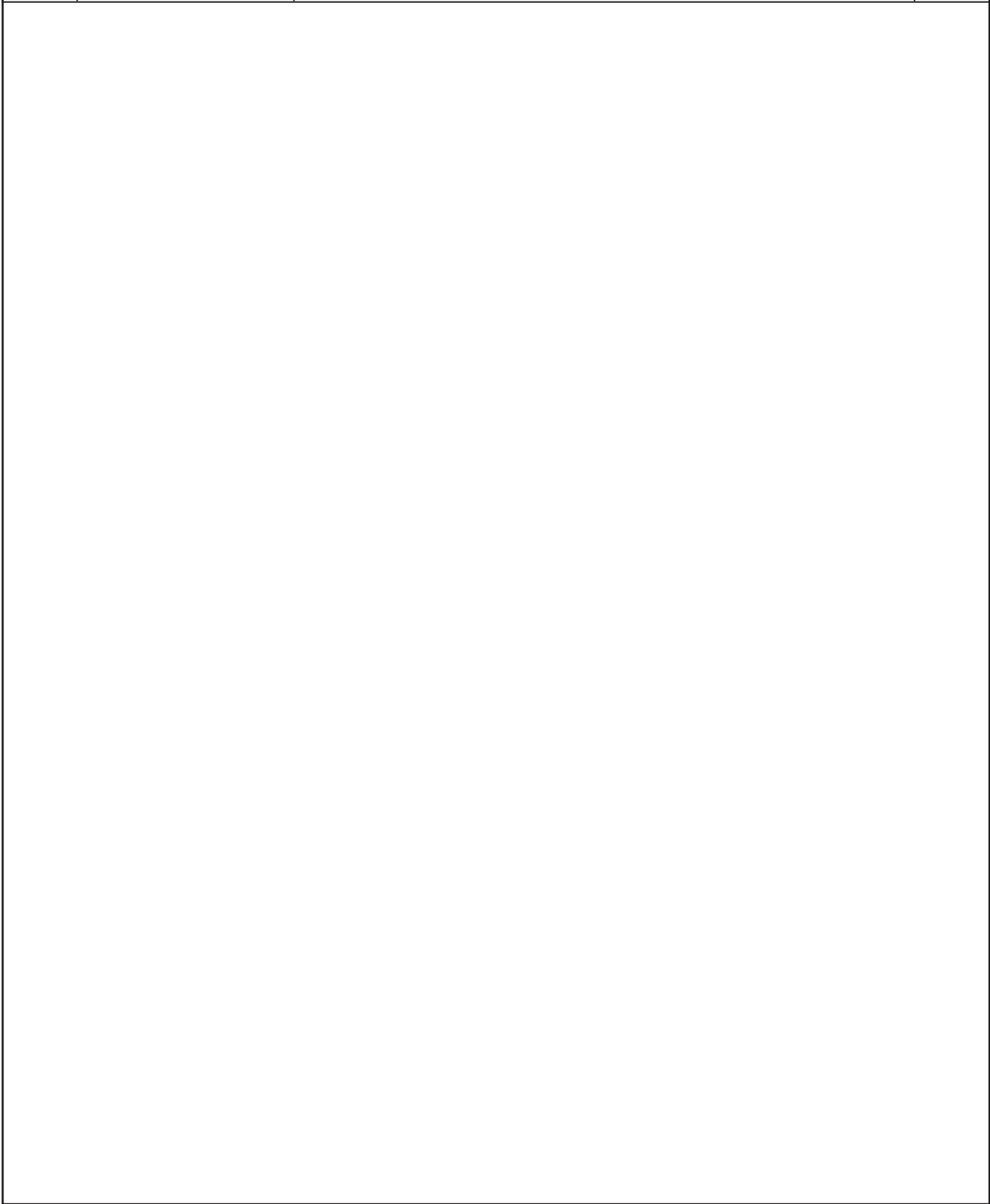
'Renovator AS3000/3500' Chains & Tensioners



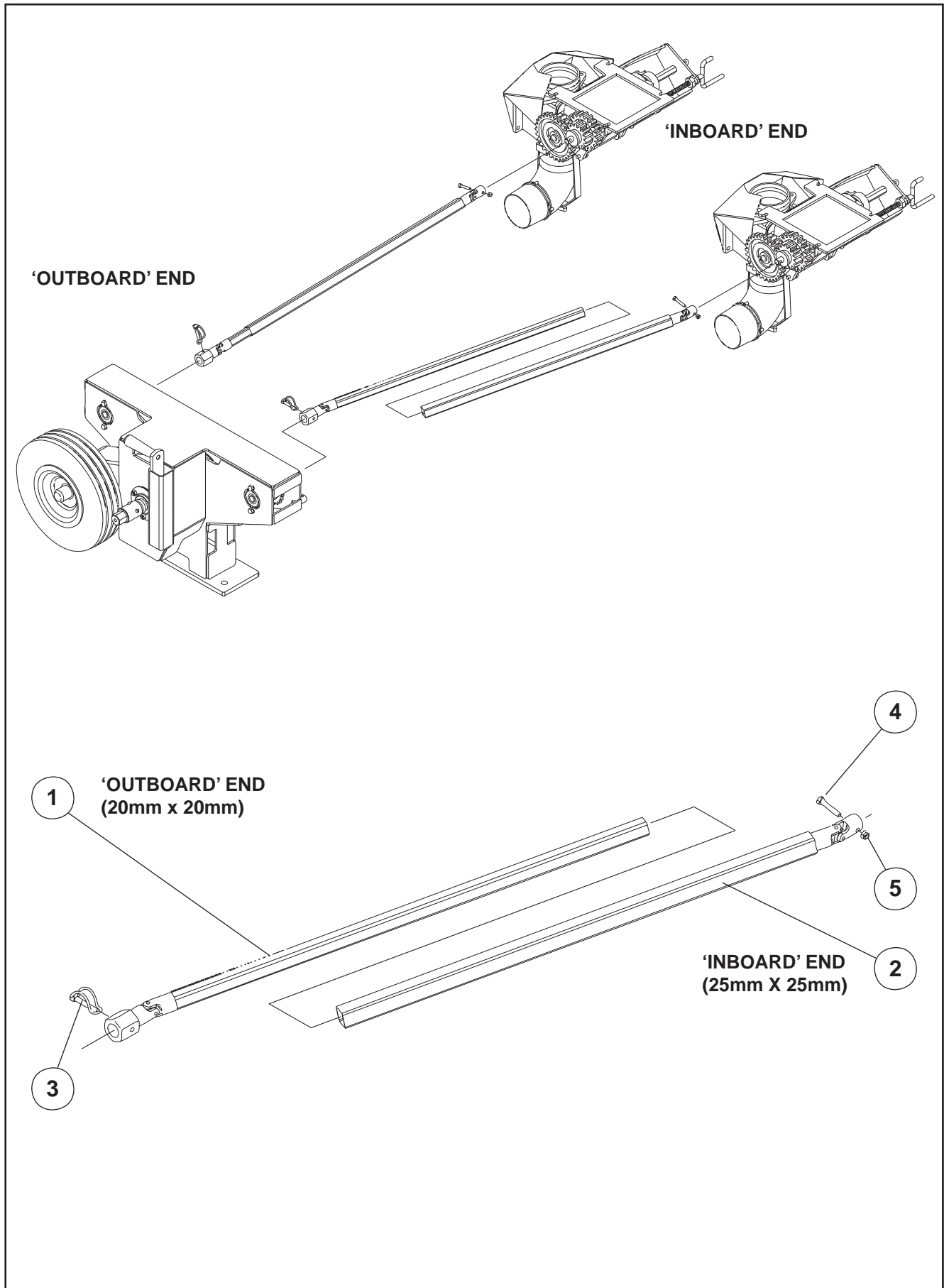
For Jockey Chain Tensioner see
items 23 to 28 on previous page

'Renovator AS3000/3500' Chains & Tensioners

ITEM	PART No.	DESCRIPTION	QTY
1	63125	1/2" BS Chain x 63 Links	2
2	44014	Plastic Chain Tensioner	2
3	24103	1/2" BS Chain x 61 Links	1
4	43388	1/2" P Joiner Link	3

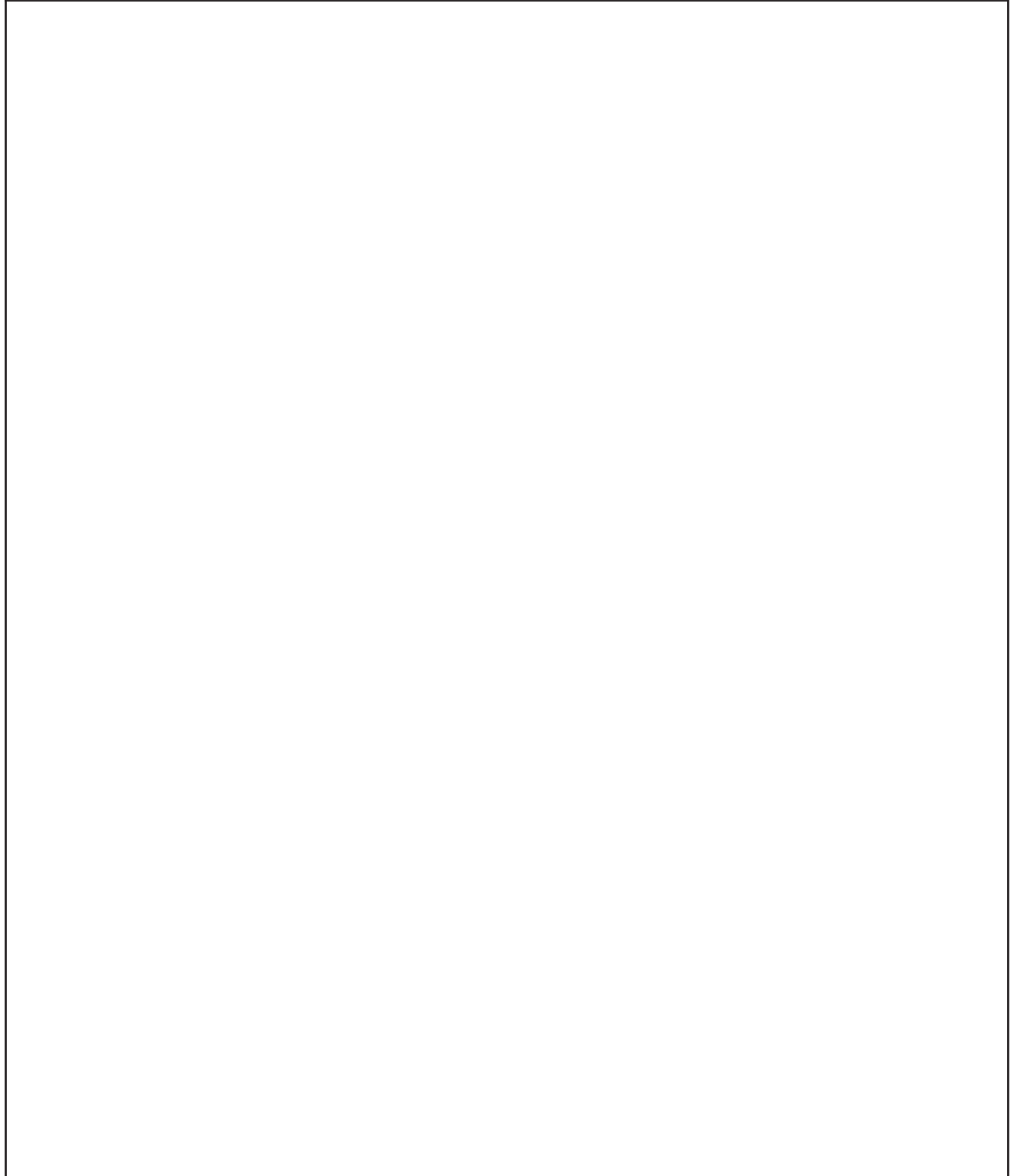


'Renovator AS3000/3500' Driveshafts (Metering)

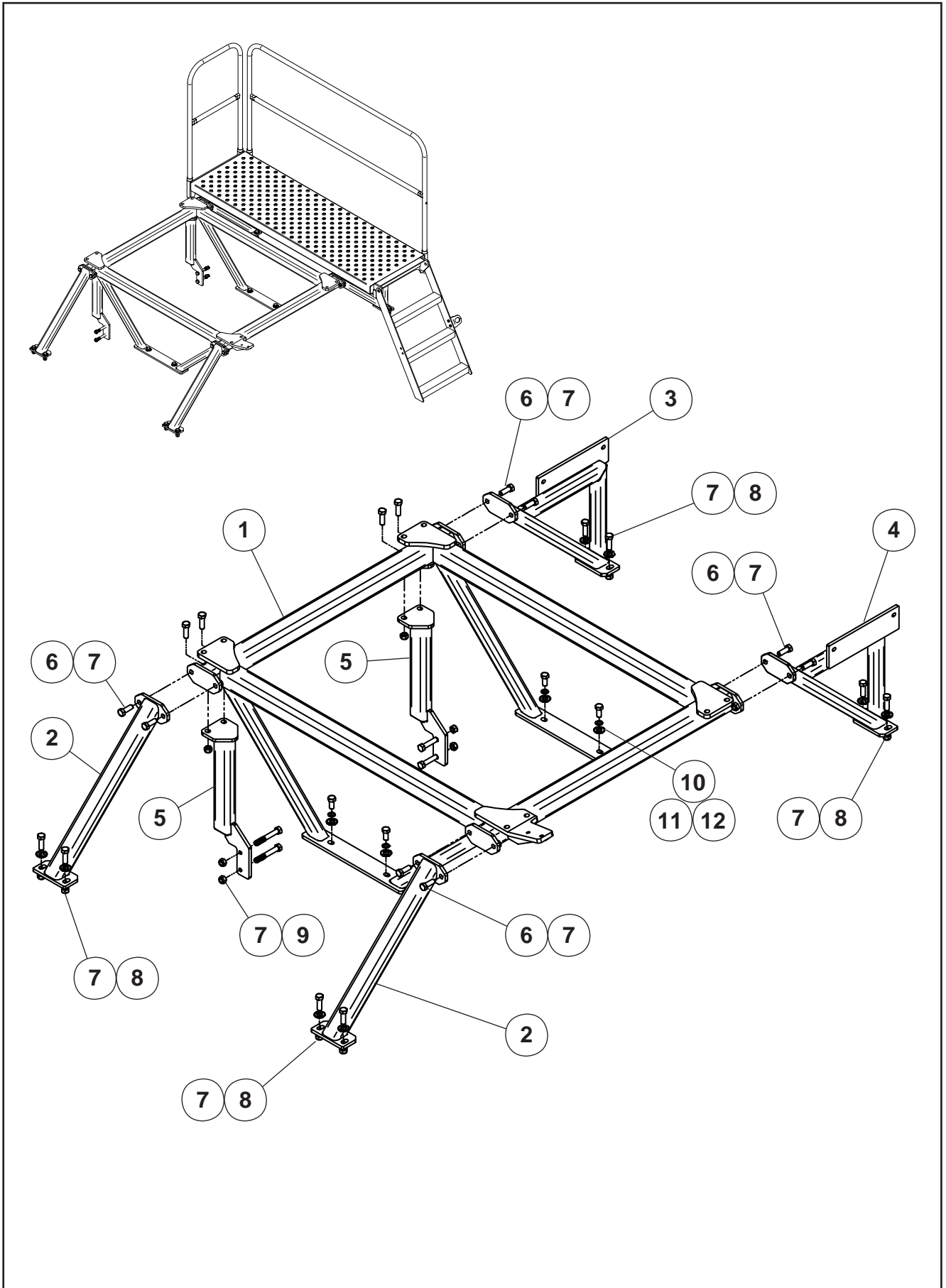


'Renovator AS3000/3500' Driveshafts (Metering)

ITEM	PART No.	DESCRIPTION	QTY
1	63230	O/Board Universal Shaft W/Assy	2
2	63231	InBoard Universal Shaft W/Assy	2
3	47615	6 x 40 Pipe Lynch Pin	2
4	44956SS	M6 x 40 304 S/Steel Bolt	2
5	45136SS	M6 Nyloc Nut Grade 316 S/S	2



'Renovator AS3000/3500' Seedbox Frame

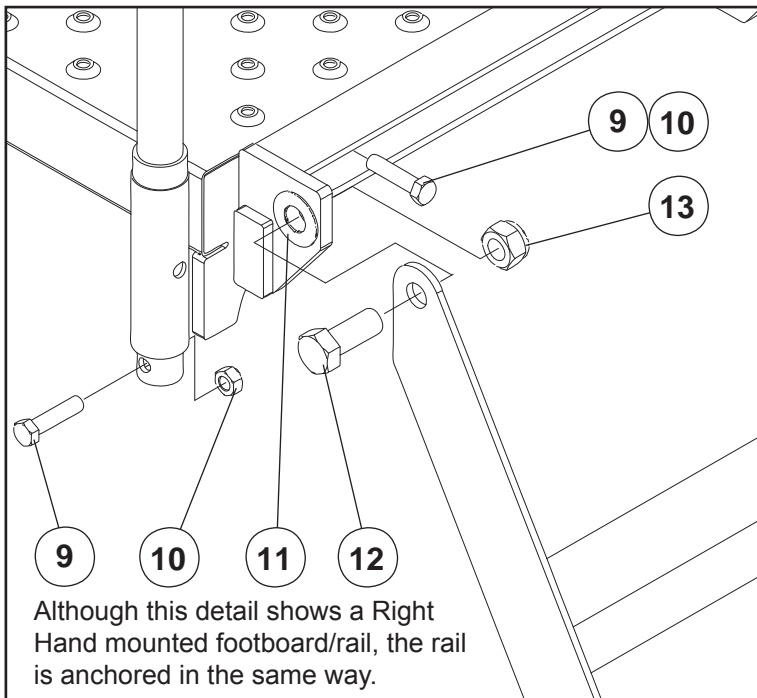
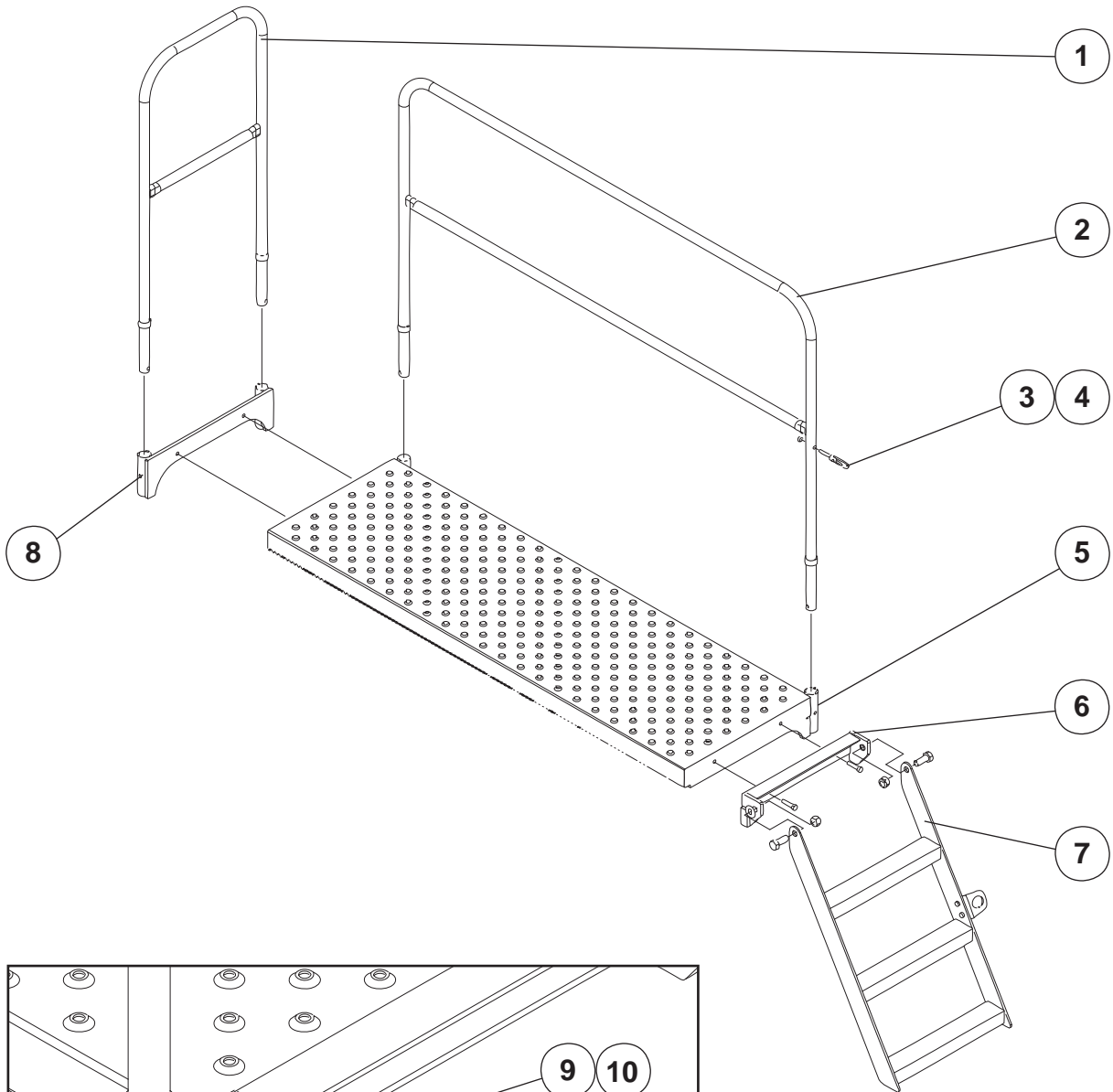


‘Renovator AS3000/3500’ Seedbox Frame

ITEM	PART No.	DESCRIPTION	QTY
1	64116	Hopper Mount Frame W/Assy	1
2	63195	Side Support W/Assy	2
3	63199	Frame Brace	1
4	63205	Frame Brace	1
5	64119	Foot Stand W/Assy	2
6	45039	M16 x 45 Grade 8.8 Z/P Bolt	8
7	45140	M16 Nyloc Nut	22
8	45040s	M16 x 50 Grade 8.8 Z/P S/Screw	8
9	45049	M16 x 110 Grade 8.8 Z/P S/Screw	4
10	45037	M16 x 35 Grade 8.8 Z/P Bolt	4
11	45168	M16 Spring Washer Z/P	4
12	45160	M16 HD Flat Washer Z/P	12



'Renovator AS3000/3500' Footboard & Ladder

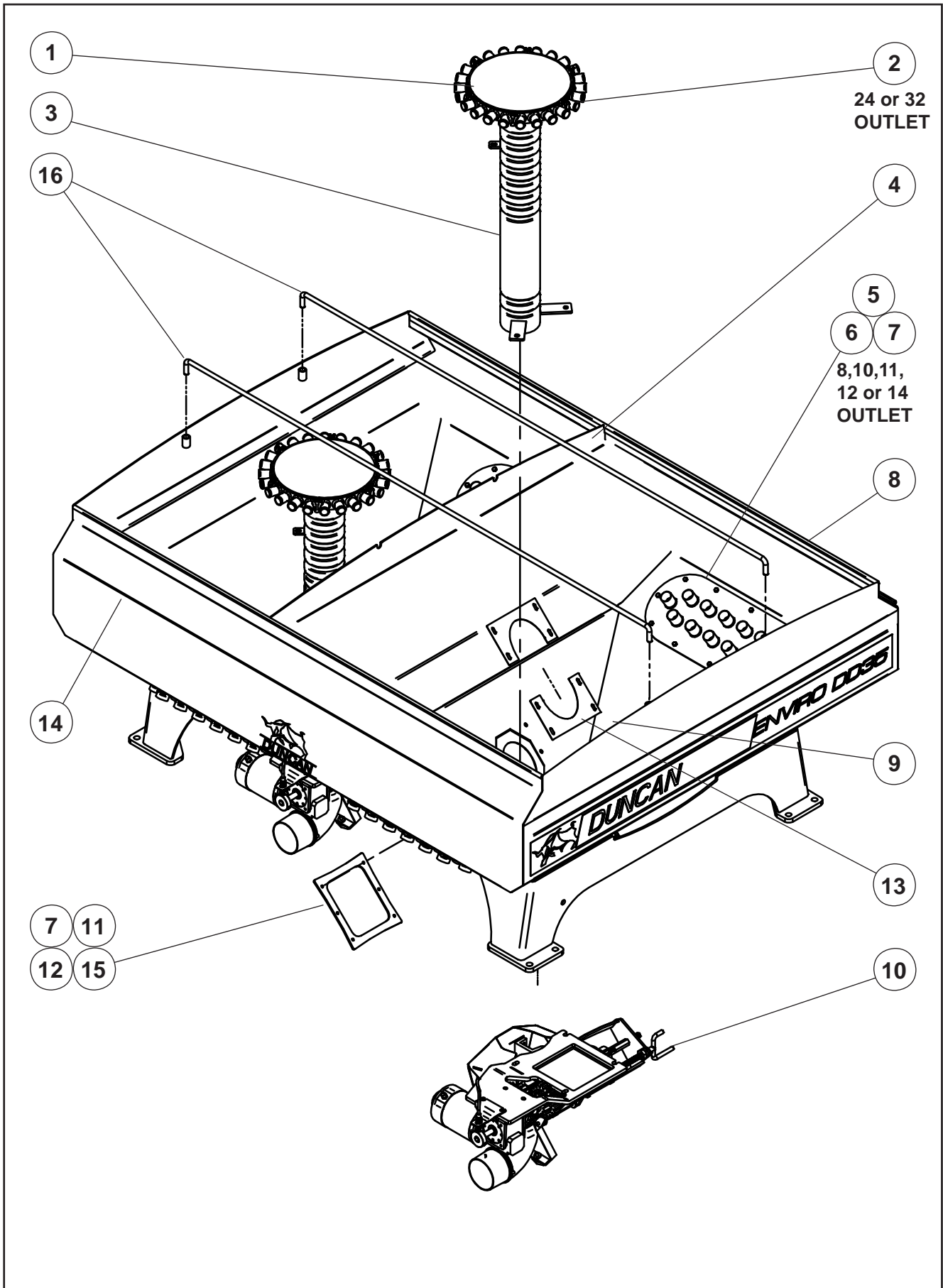


'Renovator AS3000/3500' Footboard & Ladder

ITEM	PART No.	DESCRIPTION	QTY
1	60163	End Guard Rail W/Assy	1
2	61705	Side Guard Rail W/Assy	1
3	43757	Drop Lock	1
4	45138	M10 Nyloc Nut	1
5	61700	RH Footboard Assembly	1
6	60170	Footboard Step Bracket W/Assy	1
7	63219	Ladder Assembly	1
8	64122	Guard Rail Multi-Purpose Frame	1
9	45023	M12 x 50 Grade 8.8 Z/P Bolt	8
10	45139	M12 Nyloc Nut	8
11	45155	M20 Light Flat Washer Z/P	2
12	45062	M20 x 50 Grade 8.8 Z/P Bolt	2
13	45141	M20 Nyloc Nut	2



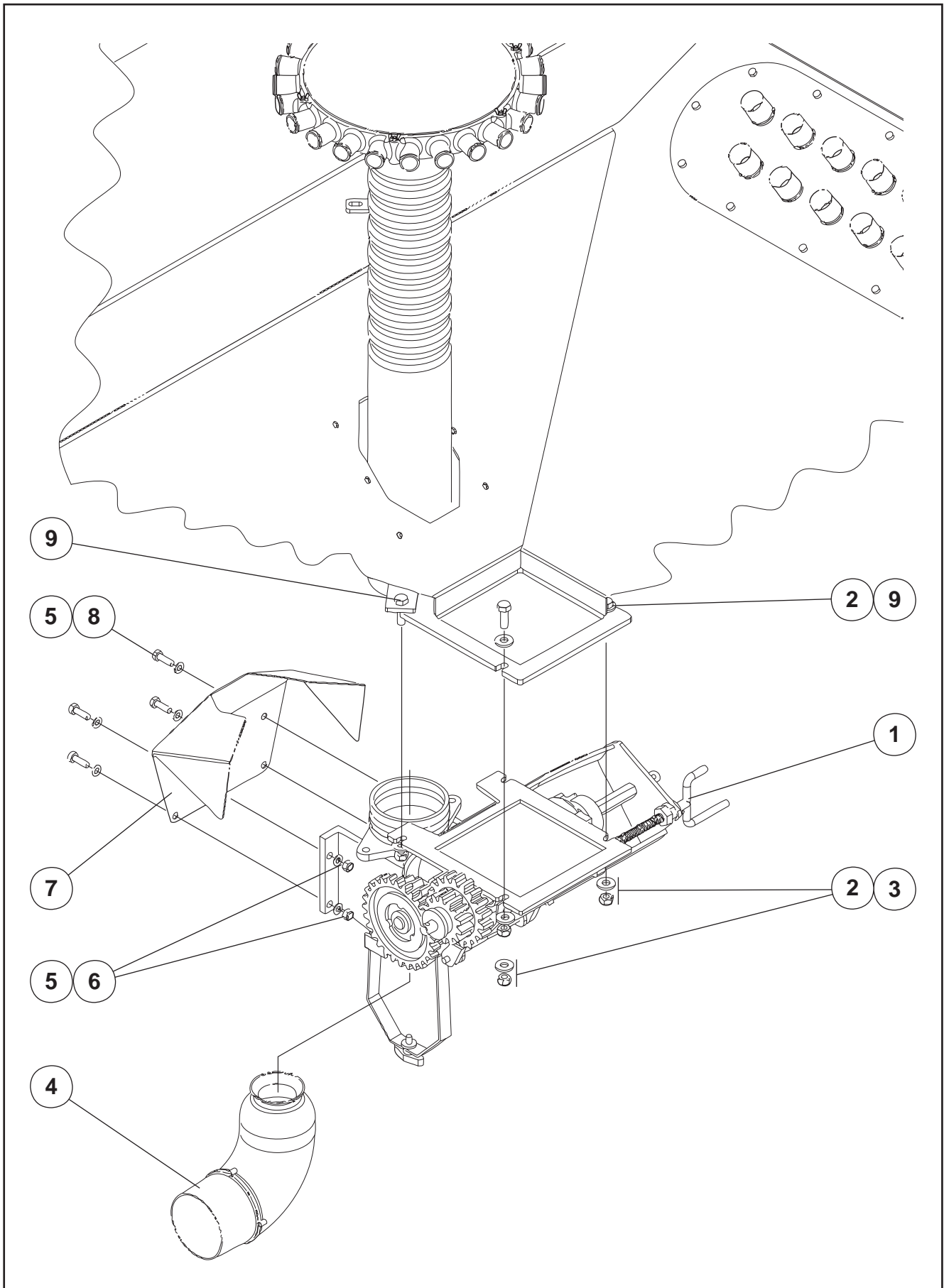
'Renovator AS3000/3500' Seed/Fert Box



‘Renovator AS3000/3500’ Seed/Fert Box

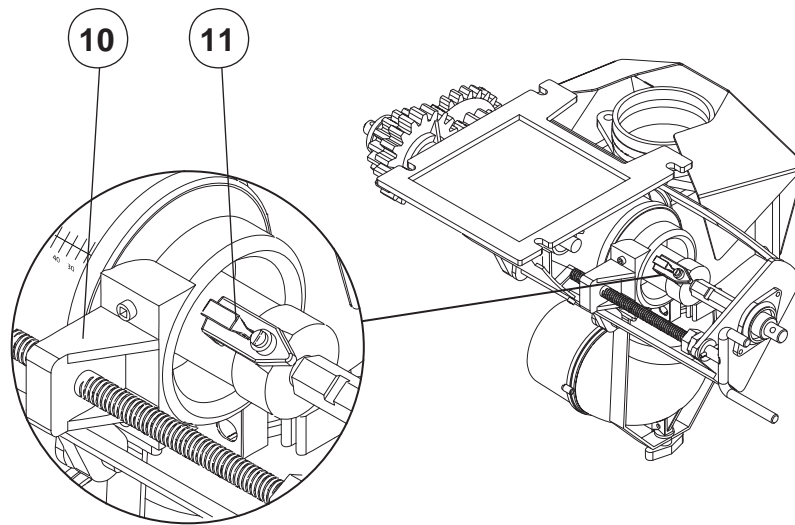
ITEM	PART No.	DESCRIPTION	QTY				
			16R	20R	21R	24R	28R
1	44064	Air Distributor Head 24 Outlet	2	2	2	2	
1	44110	Air Distributor Head 32 Outlet (for 28R)					2
2	63179	Blanking Plug Seed Distr Head (28R only)					8
2	44059	Blanking Plug Seed Distr Head	16	8	6		
3	44071	Tube	2				
4	63150	MS Hopper W/Assy	1				
5	63165	8 Hole Tube Inset Panel W/Assy	4				
5	63175	10 Hole Tube Inset Panel W/Assy		4	2		
5	63168	11 Hole Tube Inset Panel W/Assy			2		
5	63170	12 Hole Tube Inset Panel W/Assy				4	
5	63177	14 Hole Tube Inset Panel W/Assy					4
6	45401sss	M6 x 16 316 S/S S/Screw	48				
7	45136ss	M6 Nyloc Nut S/S	60				
8	43373	Edgetrim Black (per metre)	-				
9	63167	Mesh Grid Filter Hopper Bottom	2				
10	Refer Page 66	Metering Unit	2				
11	63260P	Hopper Gasket Support Profile	2				
12	45909ss	M6 x 20 Pan Pozi S/S M/C Screw	12				
13	63166P	Outlet Half Moon Profile	2				
14	63173	Cover Holding Extrusion	1				
15	45150	M6 Light Flat Washer	4				
16	63182	Hopper Cover Support Rod	2				
17	43430	Plastic lashing Hooks (not shown)	11				
18	63174	Ripstop Hopper Cover (not shown)	1				
19	63251	Air Delivery Hose Long (not shown)	1				
20	63252	Air Delivery Hose Short (not shown)	1				
21	44021	32mm Nylaflow Air Seeder Hose	30mtr	35mtr	37mtr	42mtr	49m
22	43691	38mm Nylaflow Air Seeder Hose	55mtr	62mtr	65mtr	74mtr	88m
23	45702	Pop Rivet (for item 14)	8				

'Renovator AS3000/3500' Metering Unit



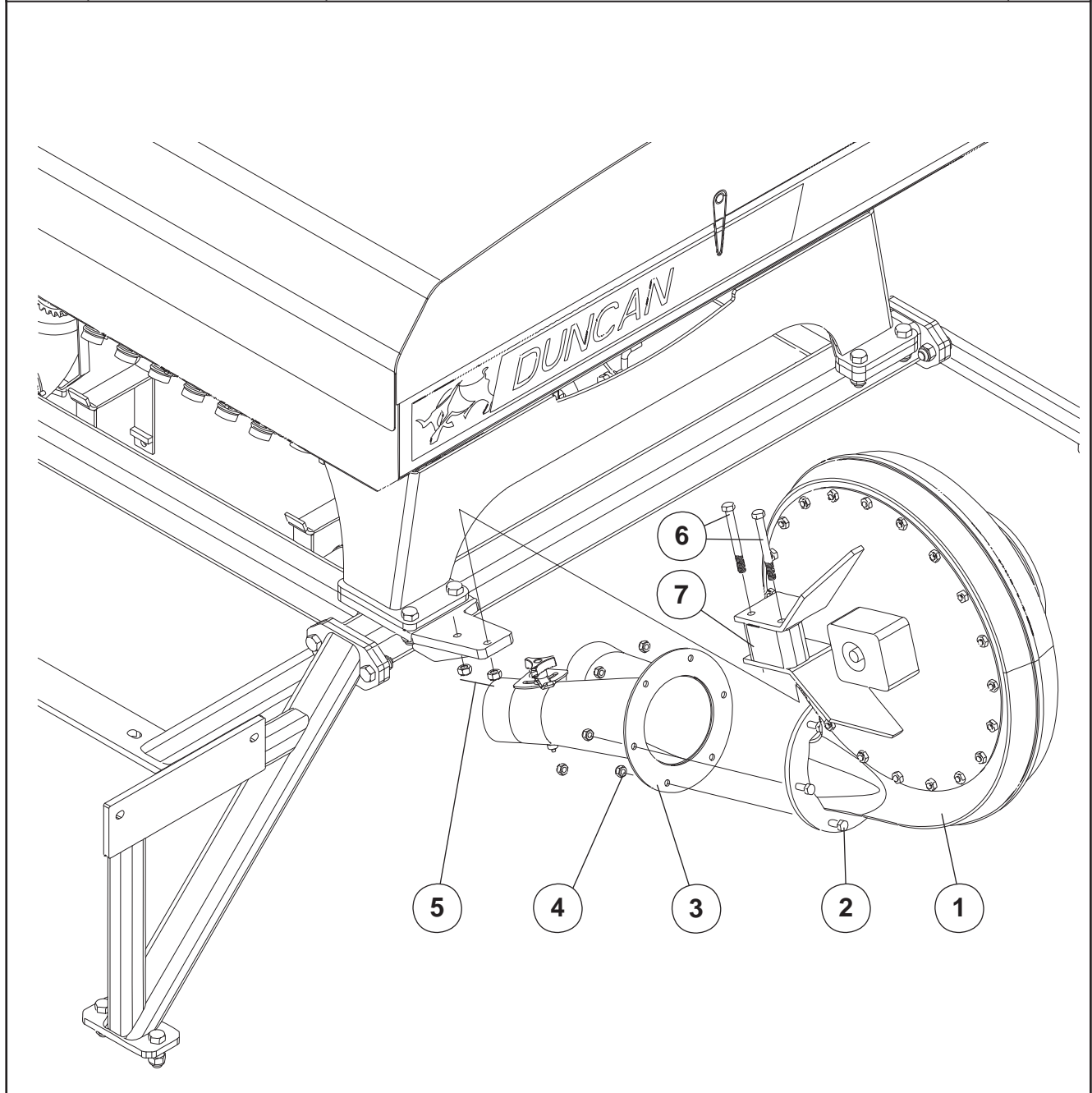
'Renovator AS3000/3500' Metering Unit

ITEM	PART No.	DESCRIPTION	QTY
1	44063	Metering Device	1
2	45152	M10 Light Flat Washer Z/P	6
3	45138	M10 Nyloc Nut	4
4	44068	Elbow	1
5	45151	M8 Light Flat Washer Z/P	8
6	45137	M8 Nyloc Nut	4
7	63259	Cover	1
8	44993s	M8 x 25 Grade 8.8 Z/P S/Screw	4
9	45004	M10 x 35 Grade 8.8 Z/P Bolt	4
10	44101	Bracket (spare)	-
11	44099	Toggle (spare)	-



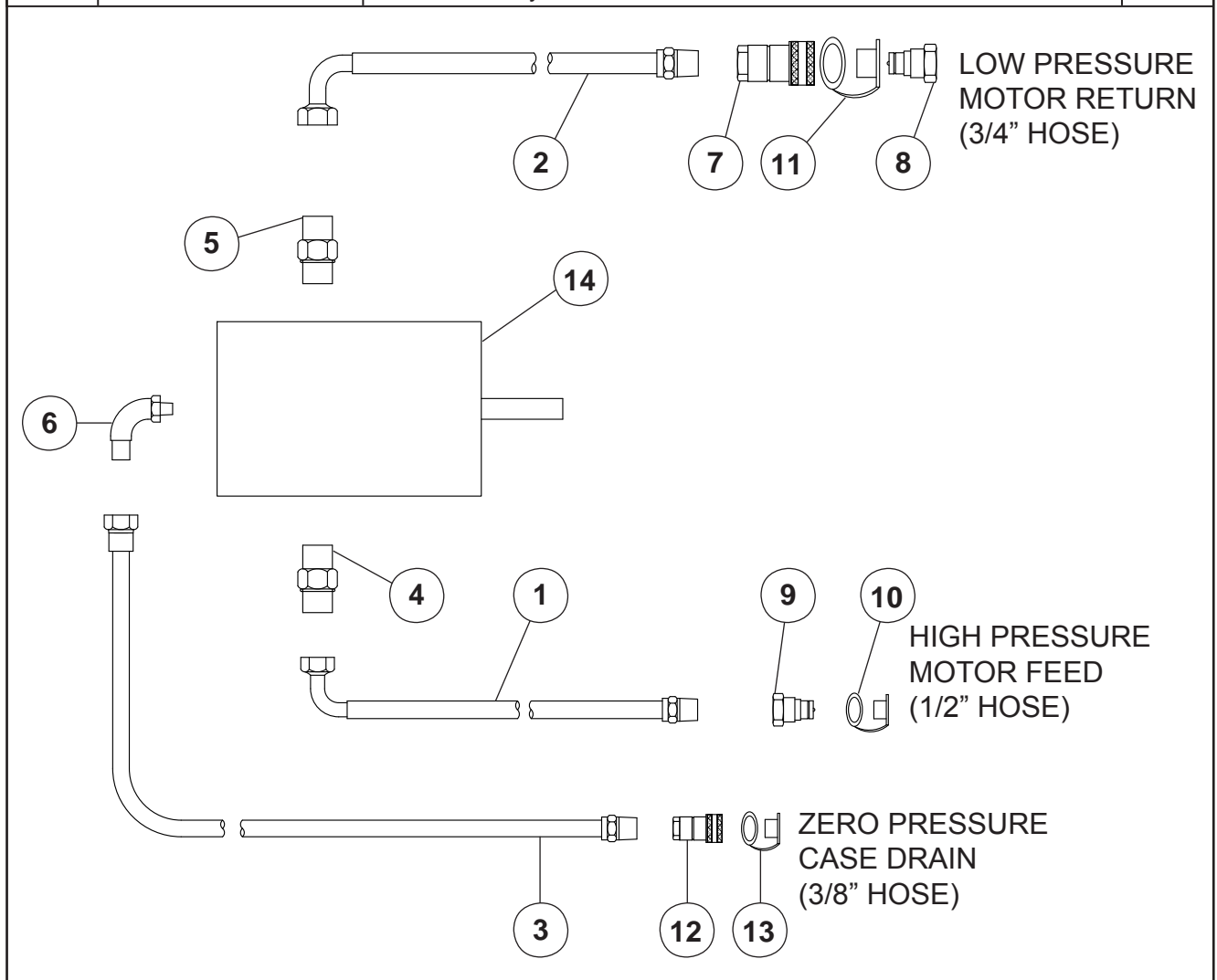
'Renovator AS3000/3500' Fan & Air Hoses

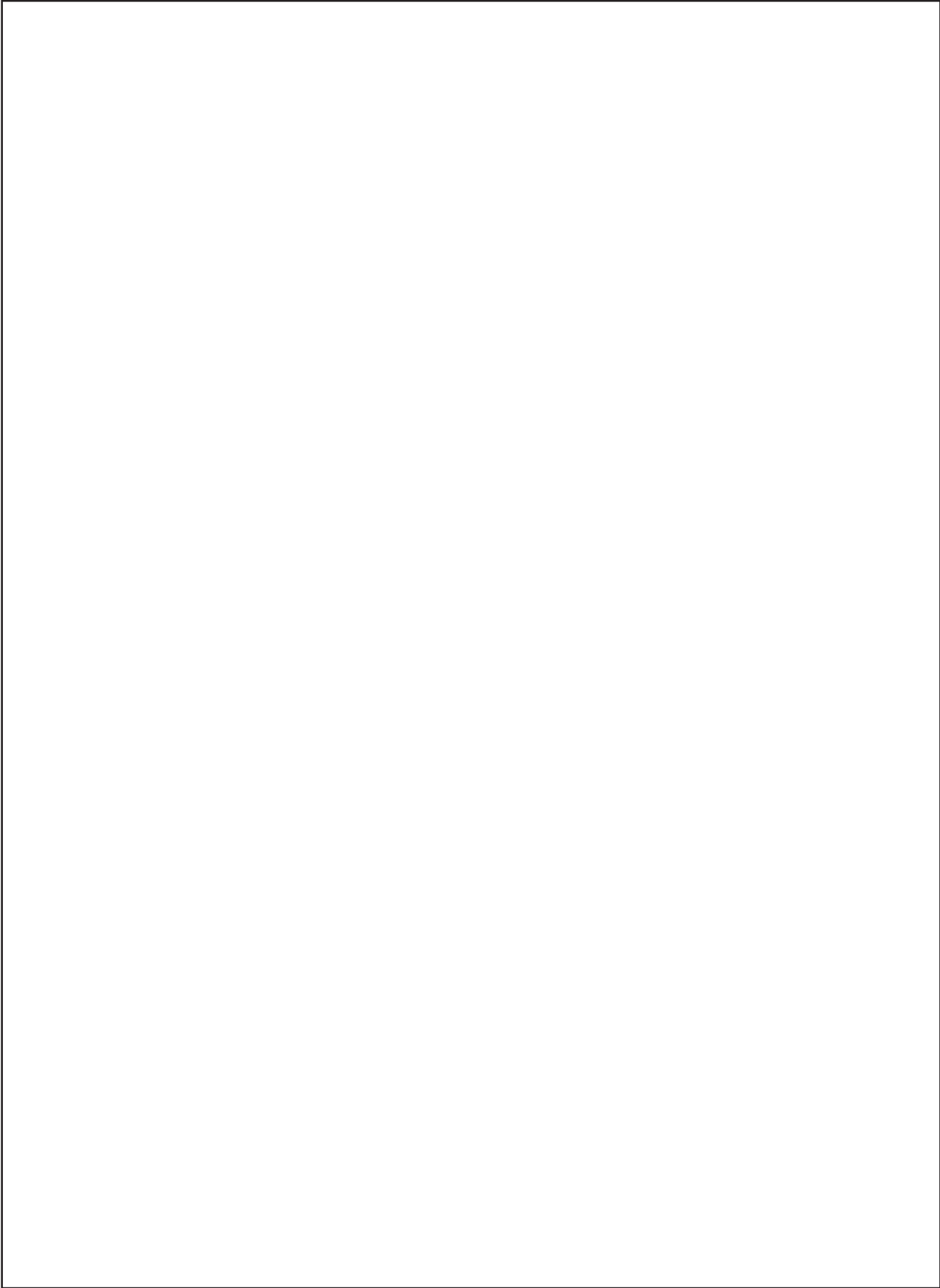
ITEM	PART No.	DESCRIPTION	QTY
1	44017	Blower 15 Series	1
2	44992s	M8 x 20 Grade 8.8 Z/P S/Screw	6
3	44018	Flanged Blower Manifold Splitter	1
4	45137	M8 Nyloc Nut	6
5	45139	M12 Nyloc Nut	2
6	45032	M12 x 110 Grade 8.8 Z/P Bolt	2
7	63237	Fan Support Block	1
8	63251	Air Delivery Hose Long (not shown)	1
9	63252	Air Delivery Hose Short (not shown)	1
10	44019	Galtech 11cc Hydraulic Motor	1



'Renovator AS3000/3500' Fan Hydraulics

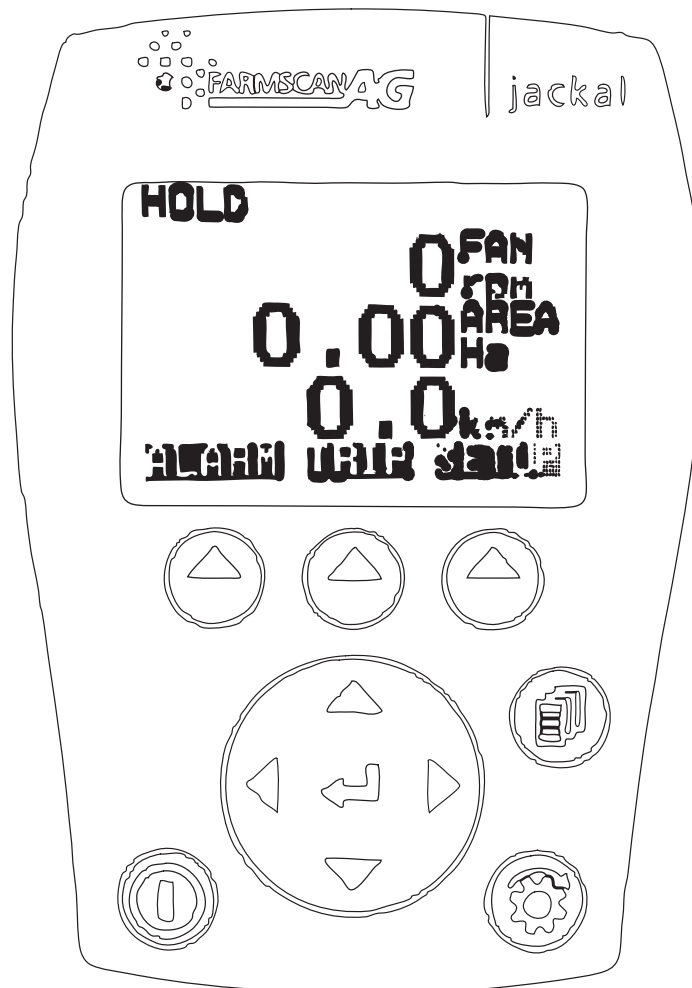
ITEM	PART No.	DESCRIPTION	QTY
-	44060k	FAN MOTOR HOSE KIT contains items 1 to 13:-	
1	44072	Hydraulic Hose (4.0m)	1
2	44073	Hydraulic Hose (4.2m)	1
3	44074	Hydraulic Hose (4.0m)	1
4	44075	7/8" UN'O x 1/2" BSPPM Nipple	1
5	44142	7/8" UN'O x 1-1/16" JIC Nipple	1
6	44078	9/16" JICF x 1/4" BSPM 90°	1
7	44080	3/4" BSP Female Q.R. Coupling	1
8	44081	3/4" BSP Male Q.R. Coupling	1
9	43147	1/2" BSP Male Q.R Coupling	1
10	43617	1/2" Female Dust Cover	1
11	44128	3/4" Male Dust Cover	1
12	43148	1/2" BSP Female Q.R. Coupling	1
13	43618	1/2" Male Probe Dust Cover	1
14	44019	Galtech 11cc Hydraulic Motor	1



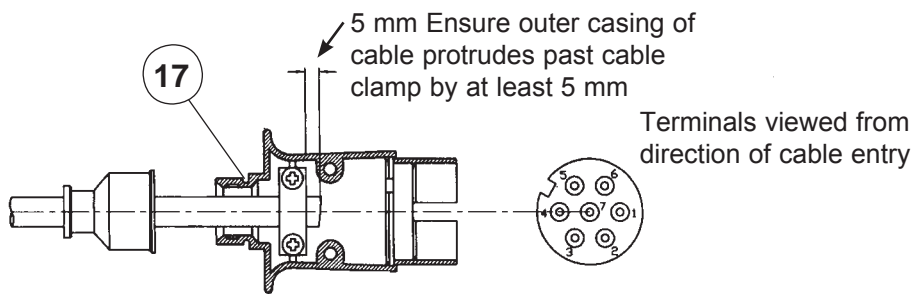
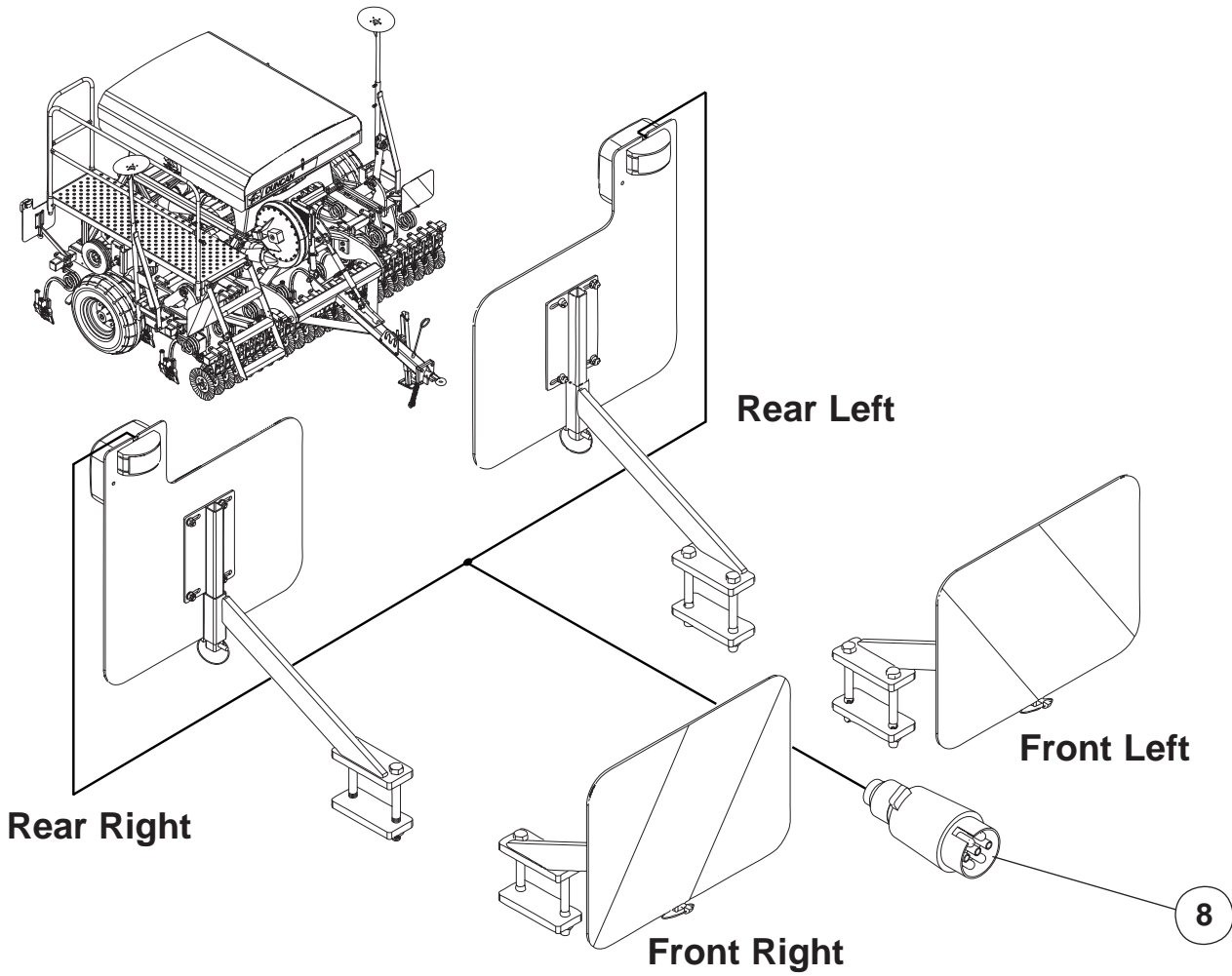


'Renovator AS3000/3500' Jackal

ITEM	PART No.	DESCRIPTION	QTY
KIT	44026K	Contains the following:	
1	44027	Areameter A-Jackal	1
2	44028	Window Mount AH-407	1
3	44029	Power Cable AC-105	1
4	44030	Hardware pack AH-JACK	1
5	44031	7.5m Cable AC-088	1
6	44032	0.3m Cable AC-213P	1
7	44033	Shaft Magnet AA-117	1
8	44034	Reed Sensor AA-110P	1
9	44035	Proximity Sensor -Blue AA2010P	1
10	44037	Owner's Manual AM-Jackal	1



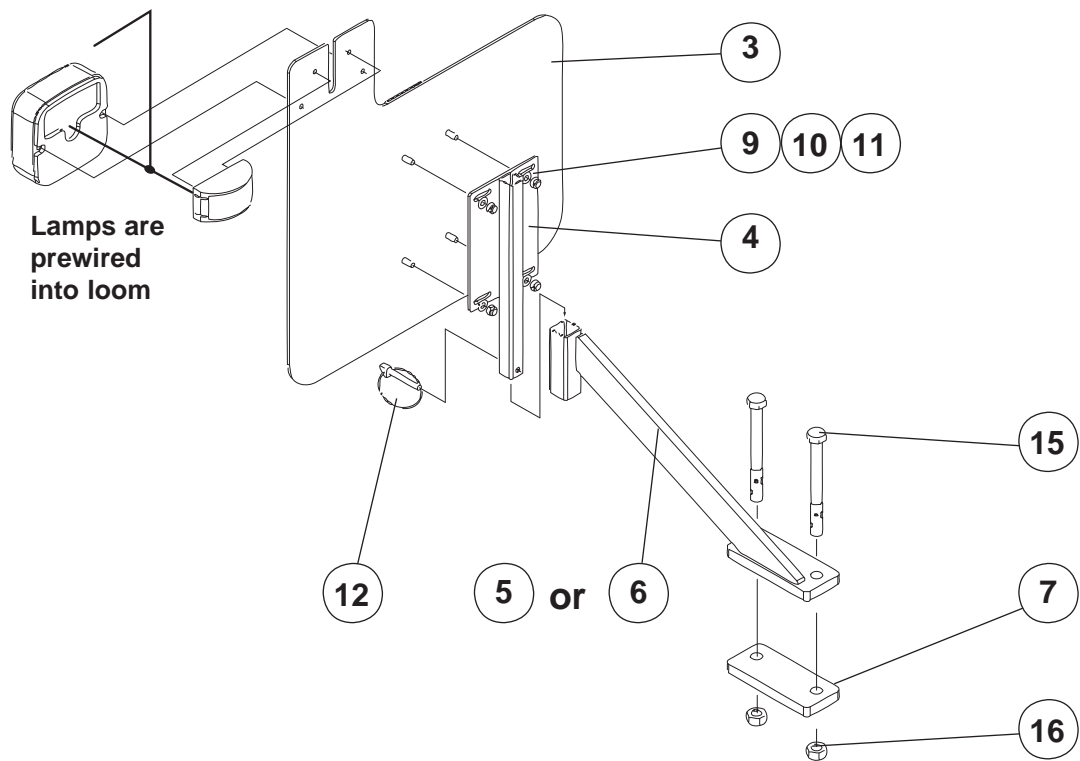
'Renovator AS3000/3500' Lighting (Optional)



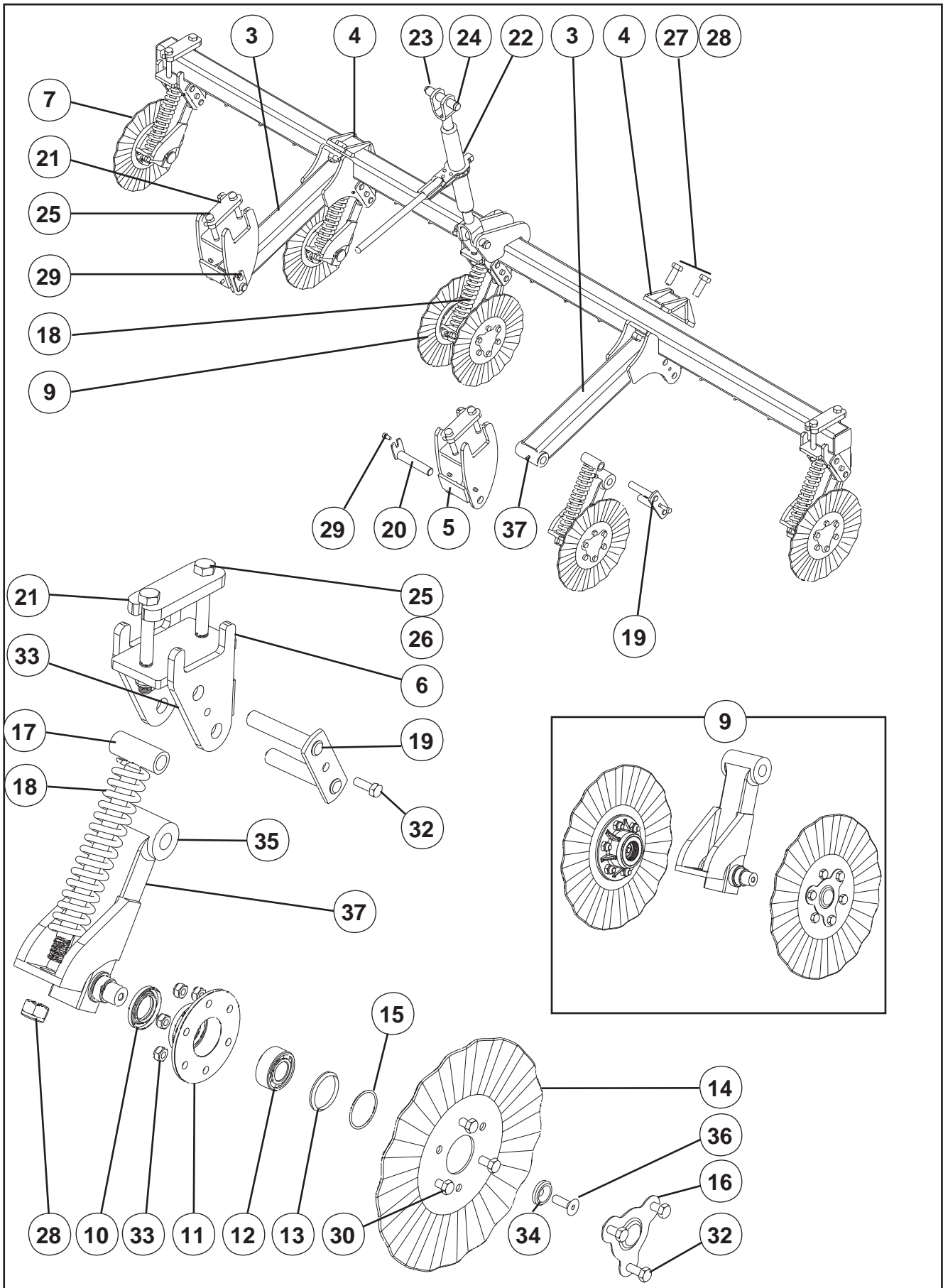
Cable Colour	Terminal Number	Function
Yellow	1	Left Indicator
White	3	Earth
Green	4	Right Indicator
Red	6	Brake/Stop
Brown	7	Tail/Side Lights

'Renovator AS3000/3500' Lighting (Optional)

ITEM	PART No.	DESCRIPTION	QTY
KIT	64012K	Contains items 1 to 16:	
1	45664	Hazard Decal Full Set	2
2	61718P#	Hazard Panel Front Profile	2
3	61719P#	Hazard Panel Rear Profile	2
4	61715	Viz Plate Holding Bracket	4
5	64128	FR-RH/RR-LH Viz Frame (Front right or Rear left)	2
6	64127	FR-LH/RR-RH Viz Frame (Front left or Rear right)	2
7	64125P#	Viz Frame Clamp Plate	4
8	60881	Loom (includes Plug and LED lights prewired)	1
9	45908	M6 x 16 Pan Pozi Z/P	16
10	45150	M6 Light Flat Washer	16
11	45136	M6 Nyloc Nut	16
12	43675	1/4" X 1 1/2" Linch Pin	4
13	43333	Plastic Tie Strap	12
14	47620	"P" Clip	4
15	45033	M12 x 120 Grade 8.8 Z/P Bolt	8
16	45139	M12 Nyloc Nut	8
17	43437	Trailer Round Connector Plug (spares)	1



'Renovator AS3x00' Disc Opener 21, 24, 28R



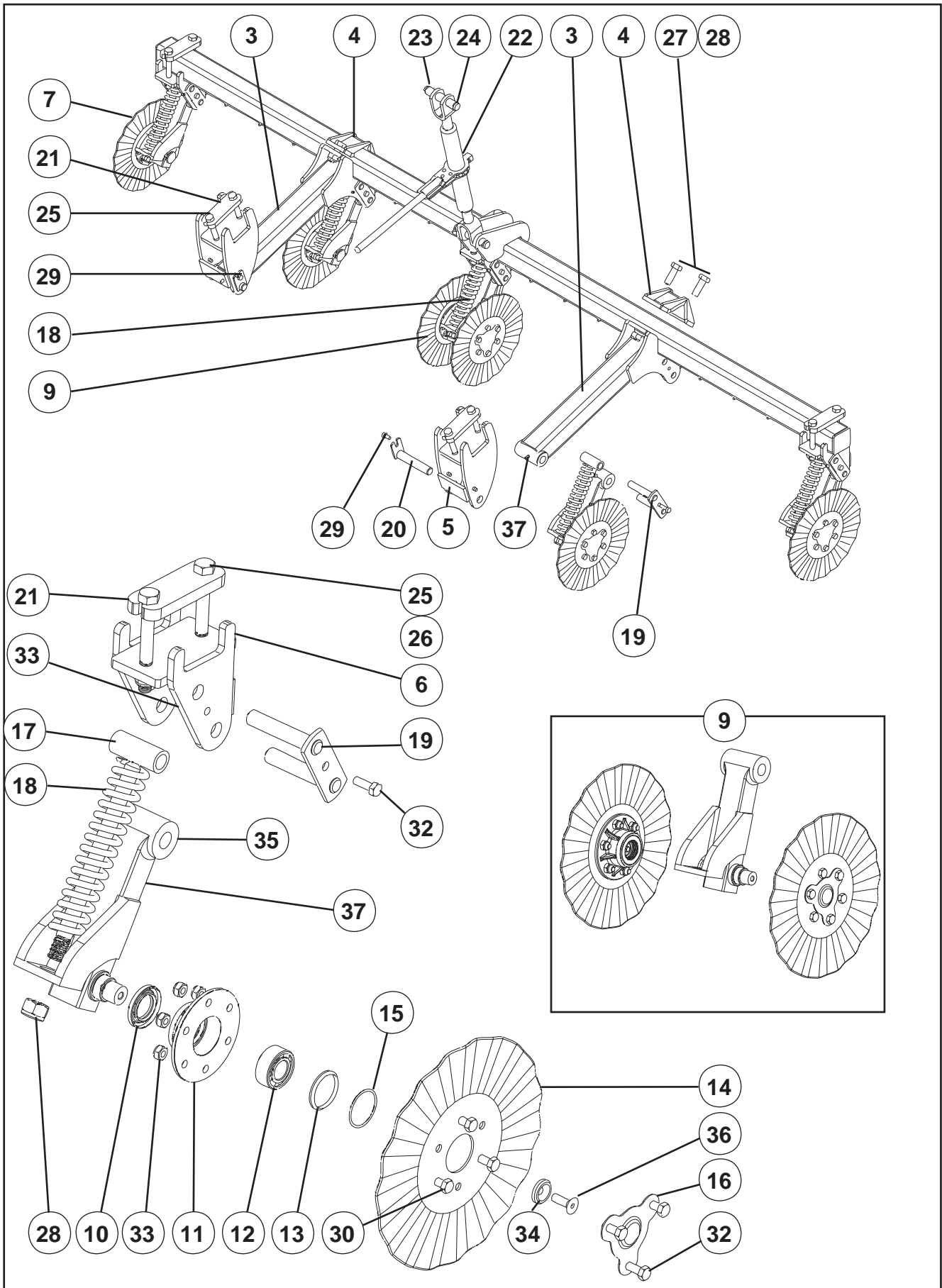
'Renovator AS3x00' Disc Opener 21, 24, 28R

ITEM	PART No.	DESCRIPTION	QTY
1	Refer Below	Disc Opener Complete	1
2	Refer Below	Disc Opener Frame	1
3	60280	Pivot Arm	2
4	60287	Angle Bracket	2
5	60290	Frame Support	2
6	60460	Mounting Bracket	20,23,27
7	60452	Single Disc Assembly LH	9,11,13
8	60453	Single Disc Assembly RH	10,11,13
9	Refer Below	Double Disc Assembly	1
10	45650	Seal	21,24,28
11	60466	Housing	21,24,28
12	45652	Bearing	21,24,28
13	60469	Bearing Retainer	21,24,28
14	22035	Fluted Disc 318mm Dia.	21,24,28
15	45653	O Ring Seal	21,24,28
16	60468	Cover Plate Stainless Steel	21,24,28
17	26310	T Bolt Spring Rod	21,24,28
18	60294	Disc Opener Spring	20,23,27
19	60450	Double Pivot Pin Assembly	21,24,28
20	60298	Attachment Arm Pivot	2
21	21690	Clamp Plate	21,24,28
22	43395	H/D Ratchet Turnbuckle	1
23	47254	Bolt 1" UNF x 5" HT	2
24	47552	1" UNF Nyloc Nut	4
25	45051	M16 X 130 Class 8.8 Bolt	40,46,54
26	45140	M16 Nyloc Nut	40,46,54
27	45063	M20 x 55 Class 8.8 Bolt	4
28	45141	M20 Nyloc Nut	24,27,31
29	45001s	M10 x 20 Class 8.8 Set Screw	2
30	45002s	M10 x 25 Class 8.8 Set Screw	126,144,168
31	45166	M10 Spring Washer	2
32	45004	M10 x 35 Class 8.8 Bolt	20,23,27
33	45138	M10 Nyloc Nut	146,167,195
34	60444	Bearing Retainer	21,24,28
35	43118	Grease Nipple Straight	21,24,28
36	45662	M10 x 30 CSK Screw	21,24,28
37	Refer Below	Axle Arm	21,24,28

PART NUMBER FOR DIFFERENT WIDTH MACHINES

ITEM	DESCRIPTION	21R 3.0m	24R 3.0m	24R 3.5m	28R 3.5m
1	Disc Opener Complete	CR21WDO	CR24NDO	CS24WDO	CS28NDO
2	Disc Opener Frame	60274	60274	60272	60272
9	Double Disc Assy	60455	60454	60455	60454
37	Single Axle Arm	L=60456 R=60457	L=60456 R=60457	L=60456 R=60457	L=60456 R=60457
	ROW SPACING	147.5mm	125mm	147.5mm	125mm

'Renovator AS3x00' Disc Opener 16, 20R



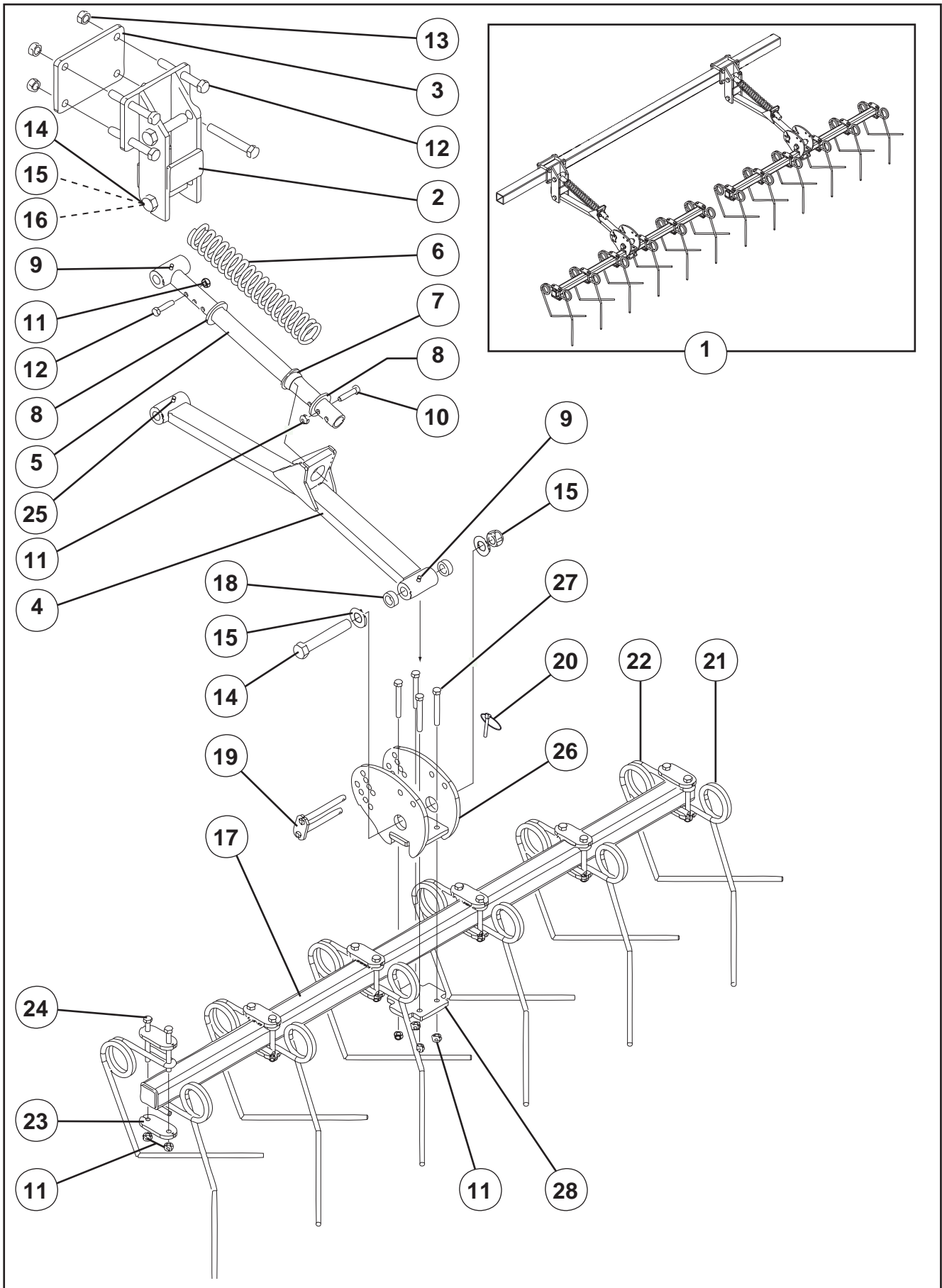
‘Renovator AS3x00’ Disc Opener 16, 20R

ITEM	PART No.	DESCRIPTION	QTY
1	Refer Below	Disc Opener Complete	1
2	Refer Below	Disc Opener Frame	1
3	60280	Pivot Arm	2
4	60287	Angle Bracket	2
5	60290	Frame Support	2
6	60460	Mounting Bracket	15, 19
7	60452	Single Disc Assembly LH	7, 9
8	60453	Single Disc Assembly RH	7, 9
9	Refer Below	Double Disc Assembly	1
10	45650	Seal	16, 20
11	60466	Housing	16, 20
12	45652	Bearing	16, 20
13	60469	Bearing Retainer	16, 20
14	22035	Fluted Disc 318mm Dia.	16, 20
15	45653	O Ring Seal	16, 20
16	60468	Cover Plate Stainless Steel	16, 20
17	26310	T Bolt Spring Rod	16, 20
18	60294	Disc Opener Spring	15, 19
19	60450	Double Pivot Pin Assembly	16, 20
20	60298	Attachment Arm Pivot	2
21	21690	Clamp Plate	16, 20
22	43395	H/D Ratchet Turnbuckle	1
23	47254	Bolt 1" UNF x 5" HT	2
24	47552	1" UNF Nyloc Nut	4
25	45051	M16 X 130 Class 8.8 Bolt	30, 38
26	45140	M16 Nyloc Nut	30, 38
27	45063	M20 x 55 Class 8.8 Bolt	4
28	45141	M20 Nyloc Nut	19, 23
29	45001s	M10 x 20 Class 8.8 Set Screw	2
30	45002s	M10 x 25 Class 8.8 Set Screw	96, 120
31	45166	M10 Spring Washer	2
32	45004	M10 x 35 Class 8.8 Bolt	15, 19
33	45138	M10 Nyloc Nut	111, 139
34	60444	Bearing Retainer	16, 20
35	43118	Grease Nipple Straight	16, 20
36	45662	M10 x 30 CSK Screw	16, 20
37	Refer Below	Axle Arm	16, 20

PART NUMBER FOR DIFFERENT WIDTH MACHINES

ITEM	DESCRIPTION	16R 3.0m	20R 3.5m
1	Disc Opener Complete	CR16EWDO	CS20EWDO
2	Disc Opener Frame	60274	60272
9	Double Disc Assy	61274	
37	Single Axle Arm	L=60456 R=60457	
	ROW SPACING	178mm	

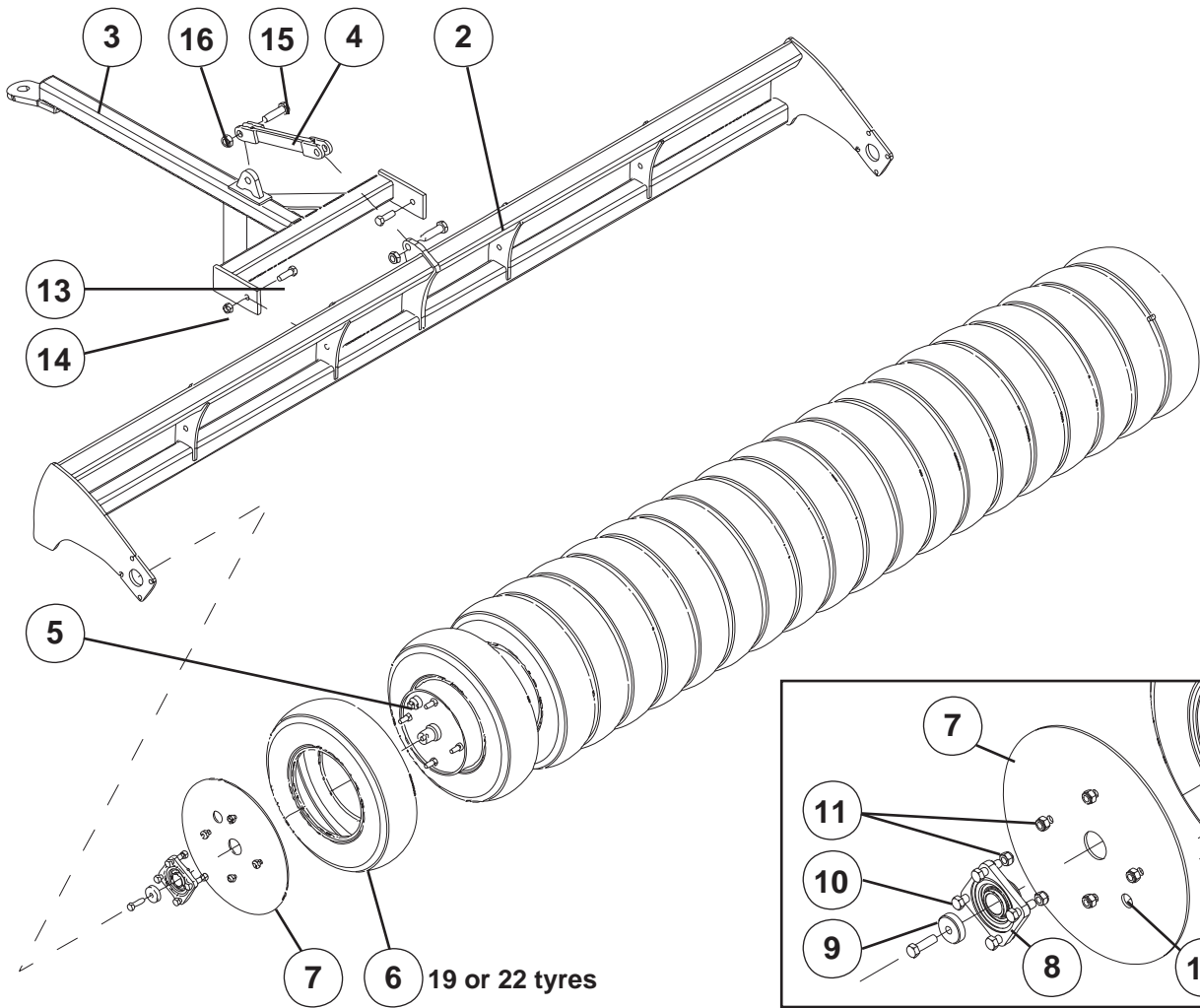
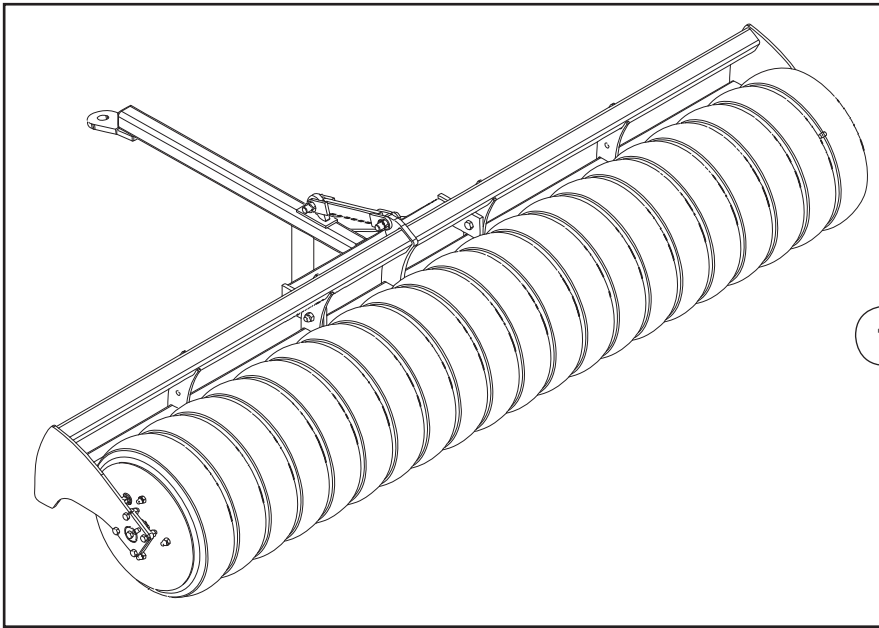
'Renovator AS3000/3500' Tine Harrow (Optional)



'Renovator AS3000/3500' Tine Harrow (Optional)

ITEM	PART No.	DESCRIPTION	QTY	
			24R	28R
1	RFT30	Tine Harrow 3.0m	1	
1	RFT35	Tine Harrow 3.5m		1
2	60426	Tine Harrow Strut W/Assy	2	
3	60428	Strut Bolt Plate	2	
4	60430	Swinging Arm W/Assy	2	
5	60435	Guidingbar W/assy	2	
6	60437	Levelling Harrow Spring	2	
7	60438	Guiding bar Bush	2	
8	60439	Guiding Spacer	4	
9	43118	Grease Nipple Straight	2	
10	45006	M10 X 45 Gr 8.8 bolt Z/P	4	
11	45138	M10 Nyloc Nut	36	
12	45050	M16 X 120 Gr 8.8 bolt Z/P	8	
13	45140	M16 Nyloc Nut	8	
14	45073	M20 X 130 Gr 8.8 bolt Z/P	6	
15	45161	M20 HD flat washer Z/P	4	
16	45141	M20 Nyloc Nut	6	
17	60423	Levelling Harrow Bar W/Assy 3.0m	2	
17	60424	Levelling Harrow Bar W/Assy 3.5m		2
18	60440	Swinging Bracket Spacer	4	
19	60441	Levelling Harrow Pivot Pin W/Assy	2	
20	43675	1/4" x 1 1/2" Lynch Pin	2	
21	60255	Levelling Harrow Tine -LH	12	
22	60256	Levelling Harrow Tine -RH	12	
23	60422P#	Double Retaining Plate Profile	24	
24	45016	M10 X 100 Gr8.8 Bolt Z/P	24	
25	43120	Grease Nipple 90°	2	
26	60421	Tine Harrow Bracket	2	
27	45013	M10 x 80 Gr 8.8 bolt Z/P	8	
28	60420	Harrow Bar Clamp Plate	2	

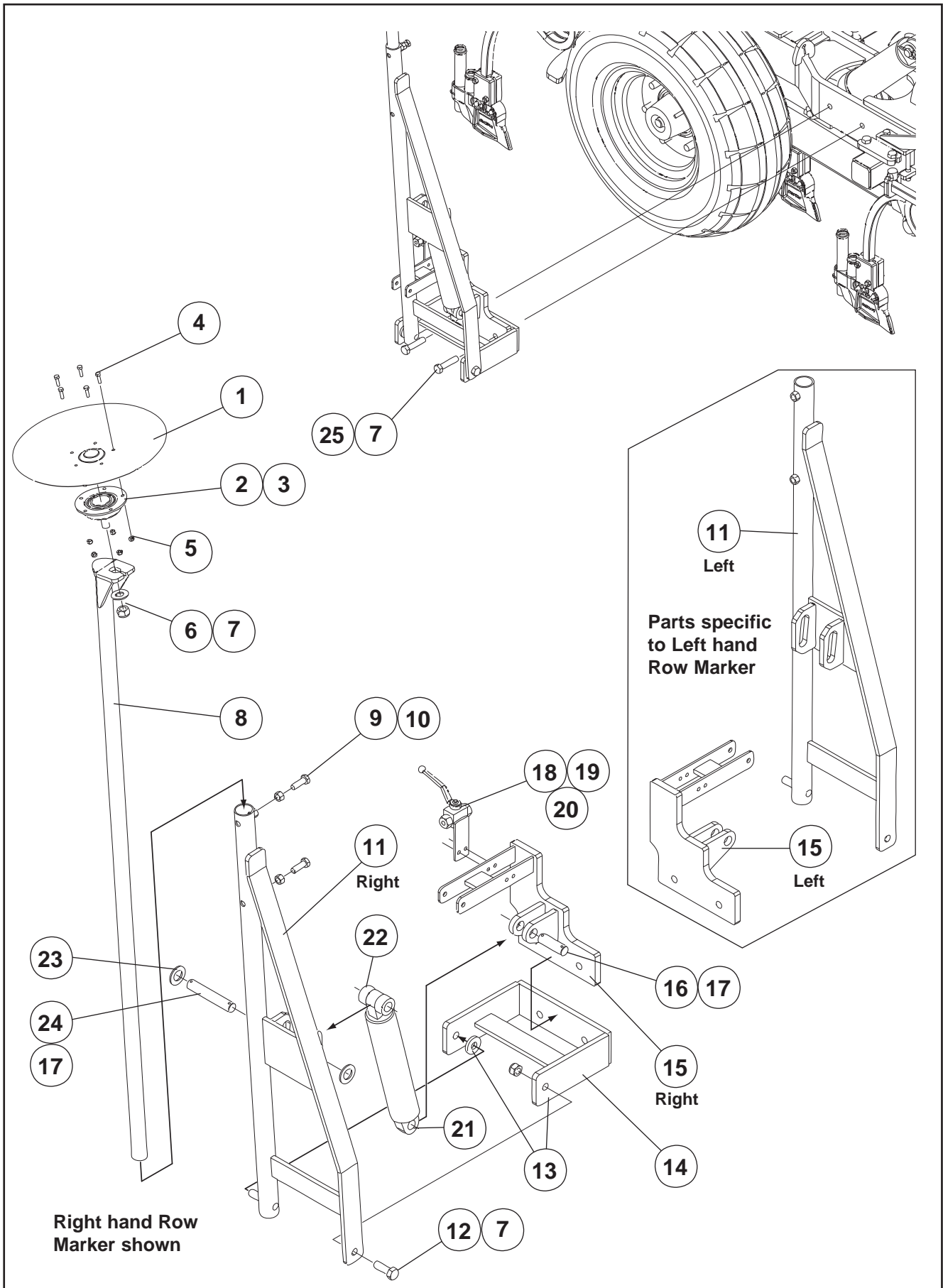
'Renovator AS3000/3500' Uni-Roller (Optional)



'Renovator AS3000/3500' Uni-Roller (Optional)

ITEM	PART No.	DESCRIPTION	QTY	
			24R	28R
1	RTR30	Uni-Roller Complete 3.0m	1	
1	RTR35	Uni-Roller Complete 3.5m		1
2	60475	Roller Frame W/Assy 3.0m	1	
2	60476	Roller Frame W/Assy 3.5m		
3	60490	Drawbar Assembly Complete	1	
4	60496	Link	1	
5	60482	Roller Tube W/Assy	1	
5	60483	Roller Tube W/Assy		1
6	43589	Tyre 185/70 R13	19	22
7	60494	End Retaining Plate	2	
8	43588	Bearing Unit	2	
9	60495	Roller Axle Retainer	2	
10	45041	M16 x 55 Class 8.8 Z/P Bolt	10	
11	45140	M16 Nyloc Nut	16	
12	43271	Drain plug	2	
13	45064	M20 x 65 Class 8.8 Z/P Bolt	2	
14	45141	M20 Nyloc Nut	2	

'Renovator AS3000/3500' Row Marker (Optional)

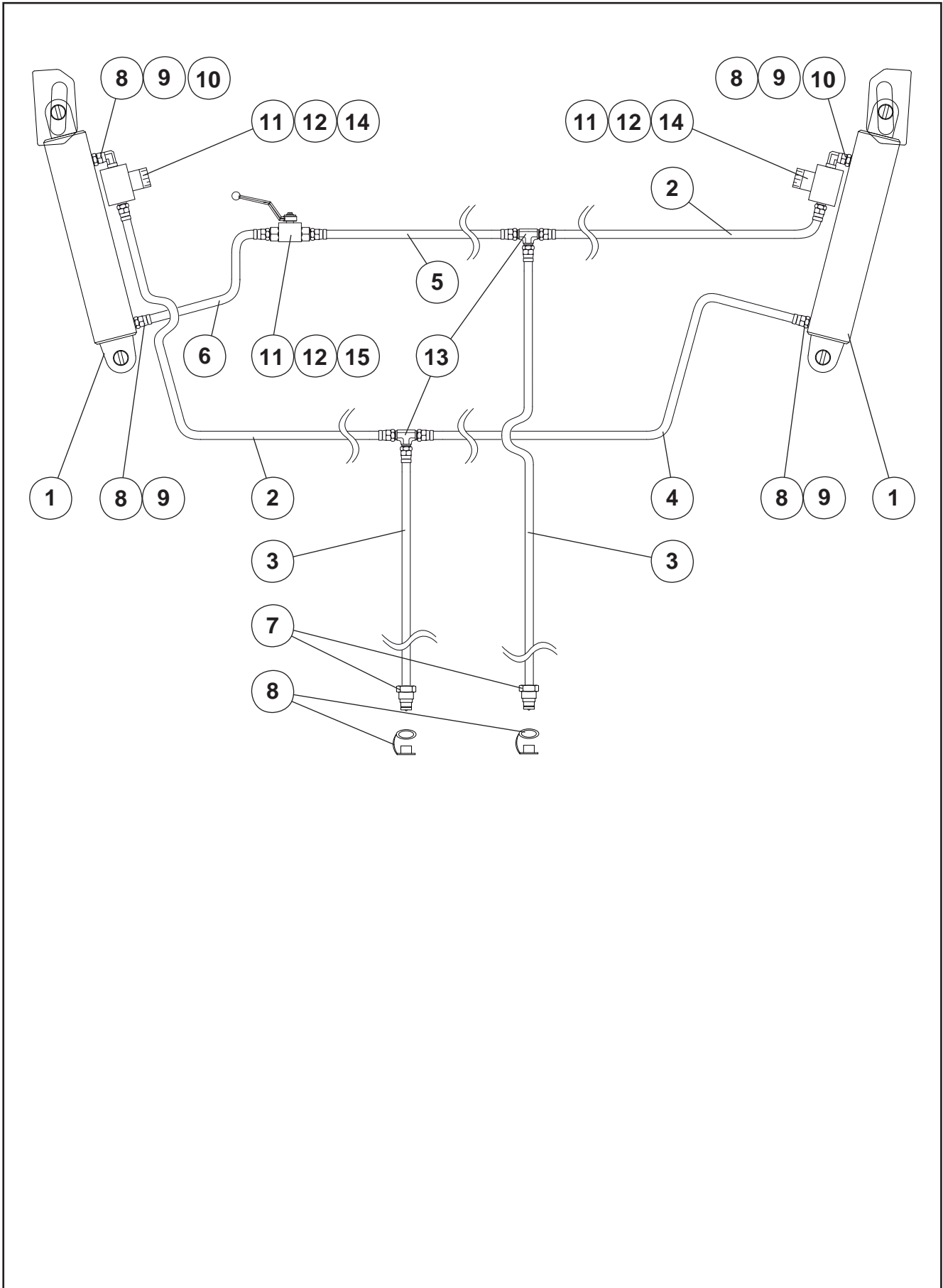


'Renovator AS3000/3500' Row Marker (Optional)

ITEM	PART No.	DESCRIPTION	QTY
KIT	61725K	Row Marker Kit:-	
1	10192	Disc	1
2	23535	Bearing Stud	1
3	14443	Bearing Housing	1
4	44952s	M6 x 20 Grade 8.8 Z/P S/Screw	6
5	45136	M6 Nyloc Nut	6
6	45160	M16 H/D Flat Washer Z/P	1
7	45140	M16 Nyloc Nut	2
8	23542	Disc Arm Assembly	1
9	45131	M12 Grade 8.8 Hex Nut Z/P	2
10	45020s	M12 x 35 Grade 8.8 Z/P S/Screw	2
11	61735	LH Frame W/Assembly	1
11	61736	RH Frame W/Assembly	1
12	45039	M16 x 45 Grade 8.8 Z/P Bolt	1
13	22416	Spacer	4
14	61726	Hinge Frame W/Assembly	2
15	61730	L/H Ram Mount W/Assembly	1
15	61731	R/H Ram Mount W/Assembly	1
16	23589	Ram Pivot Pin	2
17	45272	R Clip (S12) OR (AG7)	8
18	61749	Ball Valve Mount W/Assy	1
19	44962	M8 x 30 Grade 8.8 Z/P Bolt	2
20	45137	M8 Nyloc Nut	2
21	61751	D/A Ram 2" x 1" x 8" Compact S	2
22	61740	Frame Ram Spacer	4
23	45163	M24 H/D Flat Washer Z/P	4
24	61742	Ram Pivot Pin 126 Long	2
25	45044	M16 x 70 Grade 8.8 Z/P Bolt	4

Hydraulic hoses and component detail are shown on the next page.

'Renovator AS3000/3500' Row Marker (Optional)



'Renovator AS3000/3500' Row Marker (Optional)

ITEM	PART No.	DESCRIPTION	QTY
KIT	61743K	Hydraulic hose & Fittings Kit:-	
1	61751	D/A RAM 2" x 1" x 8" Compact S (3/8" Ports)	2
2	61745	Hose 1.65m (Tee to Outer Cylinder via Needle Valve)	2
3	61744	Hose 3.80m (Tractor to Tee)	2
4	61746	Hose 1.60m (Tee to Inner Cylinder)	1
5	61747	Hose 1.15m (Tee to Ball Valve)	1
6	61748	Hose 0.70m (Ball Valve to Inner Cylinder)	1
7	43147	1/2" BSP Male Q.R. Coupling	2
8	44103	1/4" BSPM x 3/8" BSPPM Nipple	4
9	43391	3/8" Dowty Washer/Seal	4
10	44108	1/4" BSPPM x 1/4" BSPPF Swiv 90°	2
11	44104	1/4" BSPPM MM Nipple	4
12	44105	1/4" Dowty Washer/Seal	4
13	44106	1/4" BSP Tee MMM	2
14	44107	1/4" BSP Needle Valve	2
15	61749	1/4" Ball Valve with bracket mount	1
16	44962	M8 x 30 Grade 8.8 Z/P Bolt	2
17	45137	M8 Nyloc Nut	2
18	43617	1/2" Female Carrier Dust Plug	2