Kelly
TILLAGE SYSTEM

Tillage System 6m

Operating Instruction Manual

Serial number:

Register within 2 months of purchasing the machine to receive an additional 12 months warranty.

Find the registration information on page 3

Revision C

Kelly Engineering
PO Box 100
Booleroo Centre SA 5482
Australia

Phone: + 61 8 8667 2253
Fax: + 61 8 8667 2250
Email: office@kellyengineering.com.au
Website (Australia): www.kellyengineering.com.au
Website (US): www.kellyharrows.com

Kelly Engineering Owner's Record

Keep in manual & retain for your own record

WARRANTY INFORMATION

KELLY DIAMOND HARROW

Kelly Engineering guarantees its products against faulty workmanship and materials.

Should any defects arise, Kelly Engineering will arrange at its discretion for the replacement or repair of defective parts for a period of 12 months from the date of purchase.

Disc Chain, Prickle Chain and swivel units are considered to be wear parts and it is reasonable to expect over time that these parts may need to be replaced. Kelly Engineering does however guarantee the swivel units for a period of 12 months or 10 000 acres (4000 Ha), whichever occurs first. Prickle chain and all Disc chains but the CL2 will be warranted a useful life span of 50,000 acres. The Cast linkage section of the CL2 discs are warrented for 50,000 areas, while the replaceable discs is a wear part and warranted against faulty material, Furthermore, Kelly Engineering guarantees the useful working life of the Disc and Prickle Chains to be in excess of 2 years or 50 000 acres (20 000 Ha), whichever occurs first.

Kelly Engineering is not responsible for freight charges incurred.

This warranty excludes damage caused by misuse, mishandling in transit or normal wear and tear.

All Kelly Engineering products should be maintained according to the maintenance section in the supplied manual. Any unauthorized modifications to the equipment may result in cancelation of warranty.

To activate the warranty a product registration form must be lodged with the manufacturer.

Owner's Record

Purchaser/owner

Name: _____

Address: _____

_____

Contact number: _____

Email address: _____

Purchase details

Place of purchase: _____

Date of purchase: _____

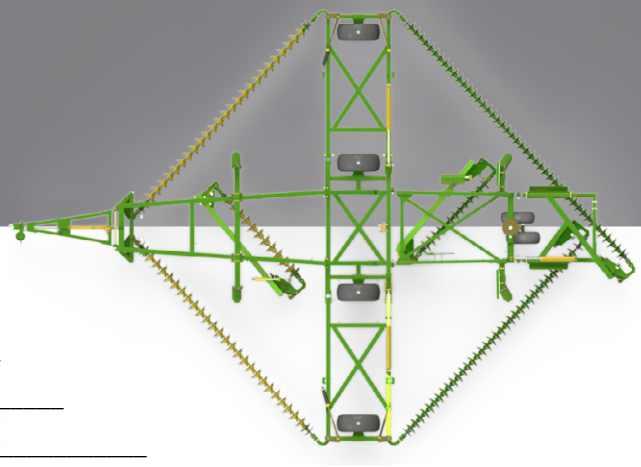
Model purchased: _____

Serial number: _____

Kelly Engineering Product Registration

Register within 2 months of purchasing the machine to receive an additional 12 months warranty

This form must be completed & returned to Kelly, either online, faxed, emailed or posted in order to receive the additional 12 months warranty



Purchaser/ owner

Name _____

Address _____

Email address _____

Contact number _____

Purchasing Details

Place of purchase _____ Date of purchase _____

Model purchase _____ Serial number _____

Occupation

◯ Farmer ◯ Customer operator ◯ Other _____

What brought Kelly Engineering products to your attention ?

◯ Field Day ◯ Friend/ neighbor ◯ Local Deaker ◯ Website

◯ Dealer ◯ Family ◯ Radio ◯ Referral Source _____

◯ Demonstration_____ ◯ Magazine/ newspaper_____

On a scale of 1 to 10 (10 being highest) how likely are you to recommend us to firends and family ?

1	2	3	4	5	6	7	8	9	10

If you scored 8 or below than what must we do to become a 10 in your eyes ?

_____

_____

If you scored 9 or above than please tell us why you gave us this score?

_____

_____

Satisfaction with dealer/ agent

Was the machine pre-delivered satisfactorily ? ◯ Yes ◯ No _____

Were agents well informed about the product ? ◯ Yes ◯ No _____

Would you recommend the agent to other farmers ? ◯ Yes ◯ No _____

Please return the registration & survey to :

Fill out online

(Australia) http://www.kellyengineering.com.au/machine-registration/

(United States) http://www.kellyharrows.com.au/machine-registration/

Email

(Australia) sales@kellyengineering.com.au

(United States) sales@kellyharrows.com

Fax

(Australia) +61 8 8667 2250

Internation dialling 011 618 8667 2250

Mail to

Kelly Engineering

PO Box 100, Booleroo Centre SA 5482 Australia

Thank you for choosing a Kelly Engineering product

We trust that you find the following manual clear and easy to follow. If you should require additional customer support or assistance, please do not hesitate to contact us.

Spare parts can be purchased, as required, through your local dealer or by contacting Kelly Engineering Australia or in the United States, Hood & Company.

Kelly Engineering welcomes feedback. Should you have any difficulties that you wish to raise, suggestions for improvement or modifications that you feel would enhance our products we look forward to hearing from you.

Australia
Kelly Engineering
PO Box 100
Booleroo Centre SA 5482
Phone: + 61 8 8667 2253
Fax: + 61 8 8667 2250
Email: sales@kellyengineering.com.au
Spare Parts: parts@kellyengineering.com.au
Website: www.kellyengineering.com.au

United States
Kelly Engineering
526 1st Street
PO Box 121
New Glarus WI 53574
Phone: 608 527 2386
Mobile: 316 304 6178
Email: waynerosenbaum@kellyharrows.com
Website: www.kellyharrows.com

Spare Parts
Hood & Company Inc
Springfield MO
Phone: 417 865 2100
Fax: 417 865 2105
Email: hoodco@hoodco.com

SAFETY FIRST

Refer to section 1 in this manual on

SAFETY INFORMATION

Read all assembly instructions and study all photographs thoroughly before assembling the unit

Please note:
Left and right is determined by standing behind the machine and looking to the front.

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Section 1
Safety Information

Safety information

Signal Words

A signal word - **DANGER**, **WARNING**, or **CAUTION**, is used with the safety alert symbol.
When you see this symbol on your machine or in this manual, be alert to instructions involving your personal safety and the safety of others.
Failure to follow these instructions can result in injury or death.

DANGER - Indicates an immediate hazardous situation that, if not avoided, will result in **DEATH OR SERIOUS INJURY**.

WARNING - Indicates a potentially hazardous situation that, if not avoided, could result in **DEATH OR SERIOUS INJURY.**

CAUTION - Indicates a potentially hazardous situation that, if not avoided, may result in a **MINOR OR MODERATE INJURY.**

Carefully read all safety points in this manual and on your machine. Keep all safety decals in good condition and replace ones that have been worn or lost. Replacement decals are available by contacting your local dealer.

Safety guidelines

- This equipment is dangerous to children and persons unfamiliar with its operation
- Do not allow persons to operate or assemble this unit until they have read this manual and have developed a thorough understanding of the safety precautions
- Do not attempt to operate this equipment under the influence of drugs or alcohol
- Review the safety instructions with all users annually.

Safety information

General operation

- Proceed cautiously under overhead powerlines and around power poles, as contact may result in the operator suffering a severe electrical shock
- Never allow anyone within the immediate area when operating machinery
- Stand clear when raising or lowering wings.

Transporting

- Always travel at a safe speed. **NEVER EXCEED 15mph (25kmph).**
- Ensure transporting taps are closed during transort to ensure machine is transorted safely
- Ensure your speed is low enough for an emergency stop to be safe and secure and reduce speed prior to turns
- Fit transport safety lock to front cylinder for highway use
- Ensure safety chain is attached correctly to the towing vehicle
- Please refer to your own state laws on the rules of transporting farm machinery on roads
- Ensure that disc or prickle chains are engaged in chain guides and supports. Discs or spikes should be clear of the ground
- Be aware of the height, length and width of the machine. Beware of obstacles and overhead powerlines
- Check local laws and use approved accessory lighting, flags and necessary warning devices on the highway during both day and night time transporting. Various safety lights and devices are available from your dealer.

Hydraulics

- **NEVER** remove hydraulic hoses or ends unless the machine is in either transport position or fully extended in working position. Relieve all hydraulic pressure before disconnecting hydraulic hoses and fittings
- Ensure all fittings and hoses are in good condition
- Do not search for high pressure hydraulic leaks without hand and face protection. A leak can penetrate the skin, thereby requiring immediate medical attention
- Double check that all is clear before operating hydraulics
- Maintain proper hydraulic fluid levels and pressure.

Maintenance and inspection

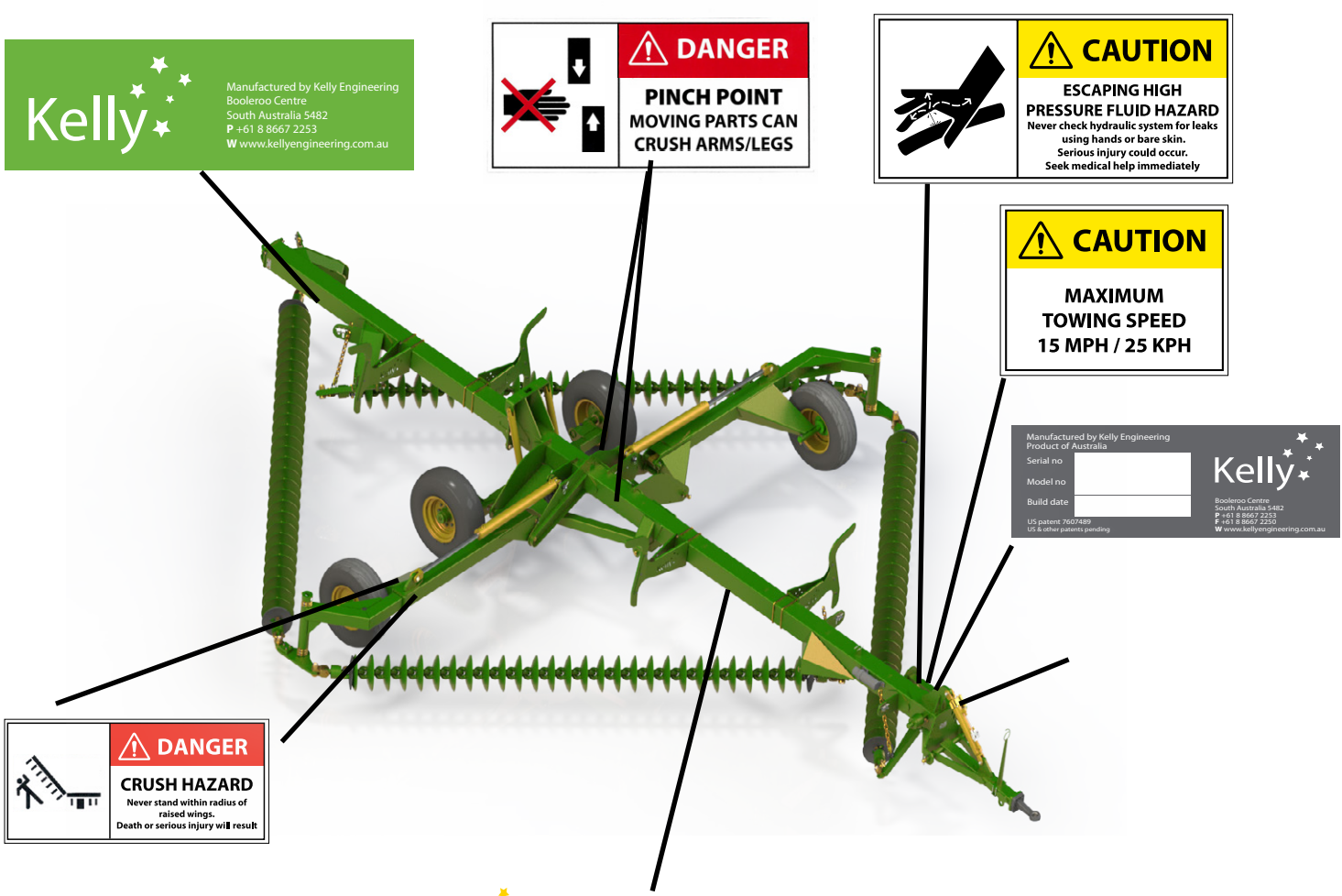
- Good maintenance is your responsibility.
- Regular maintenance and inspection is imperative.

Guidelines can be found on pages 24-25 in the Operation section

If any safety decals are missing please contact your local dealer immediately and do not use the machine

Safety information

Safety decals - individual placement



Kelly Diamond Harrow 6m

CHECK WHEEL NUTS
AFTER FIRST .5 HRS
AND AT REGULAR INTERVALS

If any safety decals are missing please contact your local dealer immediately and do not use the machine

Safety information

Safety decals - individual placement

Kelly Diamond Harrow 6m

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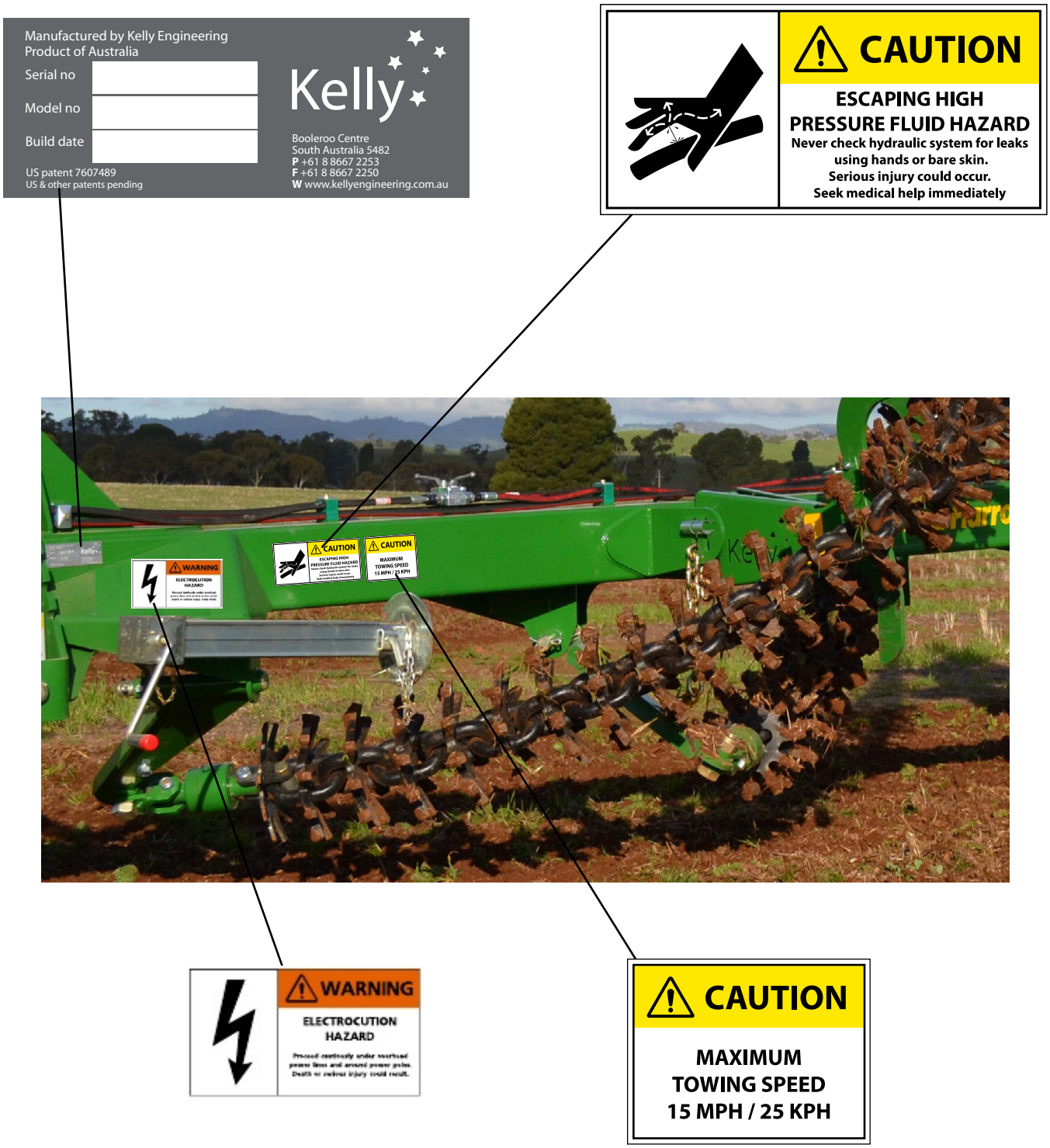

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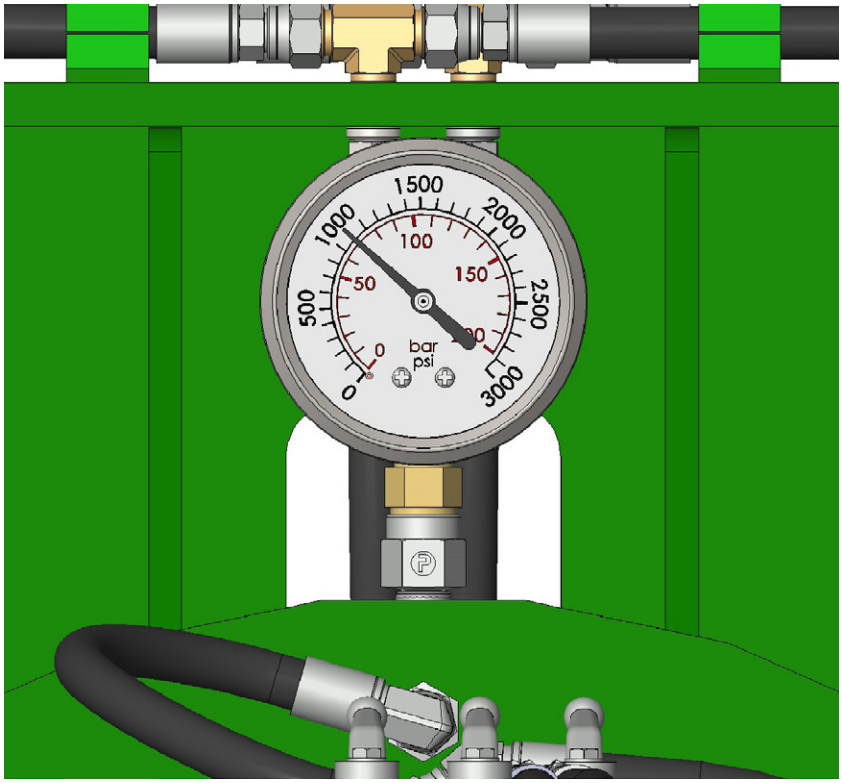
Safety information

Safety decals - individual placement



The chain is set correctly at 1000 PSI

CHECK WHEEL NUTS
AFTER FIRST .5 HRS
AND AT REGULAR INTERVALS

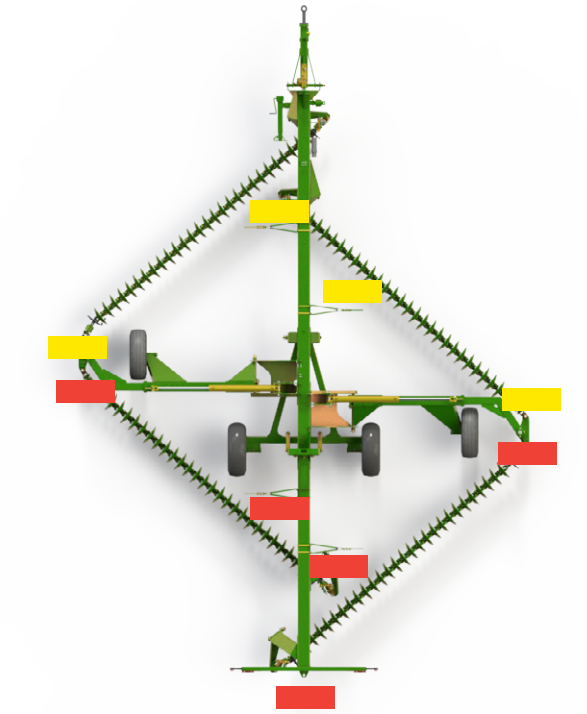
If any safety decals are missing please contact your local dealer immediately and do not use the machine

Safety information

Safety decal - individual placement

Red reflective tape

Yellow reflective tape



Red reflective tape - quantity : 5
Locate facing rearwards on each wing section
Facing backwards on outer face of chain catch
On rear plate

Yellow reflective tape - quantity: 4
Locate facing forwards on outer point of each wing section
Facing forward on outer face of chain catch

If any safety decals are missing please contact your local dealer immediately and do not use the machine

Section 2
Operation

Operation

Before operation

- Carefully study and understand this manual
- Do not wear loose fitting clothing that may catch in moving parts
- Always wear protective clothing and substantial shoes
- Be sure that there are no tools lying in or on the equipment
- Do not use the machine until you are sure that the area is clear, particularly of children or animals
- If this machine is being used in a dry area, or in the presence of combustibles, care should be taken to prevent fires and fire fighting equipment should be readily available
- Don't hurry the learning process or take the machine for granted. Ease into it and become familiar with your new equipment
- Familiarize yourself and other operators with the machine's operation before using.

Pre-operation checklist

Check

1	All bolts and nuts are tightened to the correct torque values
2	Split pins are in place
3	Stickers and warning signs are in place
4	Hydraulic fittings are tight
5	Wheel nuts are tight
6	Chains are adjusted so that there is still travel in the adjustors and chains are tight
7	Fold machine to ensure chains engage chain hangers

Machine set up prior to operating

Unfold machine.
Extend lift cylinders until the float pins are
centerd in their slots.
(To allow wing oscillation in uneven terrain).

Operation

Basic operation

Unfolding:

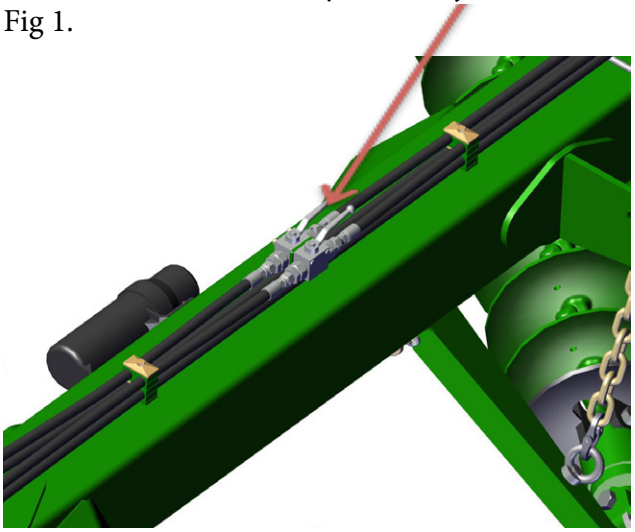
1. Walk around and inspect the machine.
   a. Check that chains are not hooked on framework
   b. Check swivel bolts are in place and not broken
   c. Check that height adjusting chains have not fallen out of their slotted plates during transport.
2. Open both transport safety lock valves at the front of the machine (see Fig 1 for location of valves)
3. Lower front A frame to working height.
4. Unfold wings holding the hydraulic lever until the main center cylinder pins have centerd in their slots. As seen in Fig 2 make sure tap is open and keep holding the pressure on the unfold leaver until the pressure gauge reads 1000 PSI. Please note pressure control valve is pre-set to correct pressure.
5. Turn tension isolated valve off (see Fig 2 for location of valve).
6. Walk around and check that all chain links are straight and that working height of all swivels is correct for field conditions. Adjust if neccessary.
7. Move off with all chains in working position. If neccessary it is acceptabe to raise front A pull to transport height. This will lift the front chains off the ground and reduce the load on the tractor. Lower the front A pull once moving satisfactorily.

Folding:

1. Lower the front A frame to working height. (This is important to ensure that all chains locate correctly in their transport rests).
2. Fold the wings. They should move as follows; main center cylinders will retract, one or both, until the wings stand vertically. **(You do not have to take the pressure off to fold)**
3. Raise the wheel cylinders to transport height.
4. Level with the front cylinders
5. Lock the two transport safety lock valves off for transport (see Fig 1 for location of valves).
6. Walk around and check that chains have located correctly in transport rests.

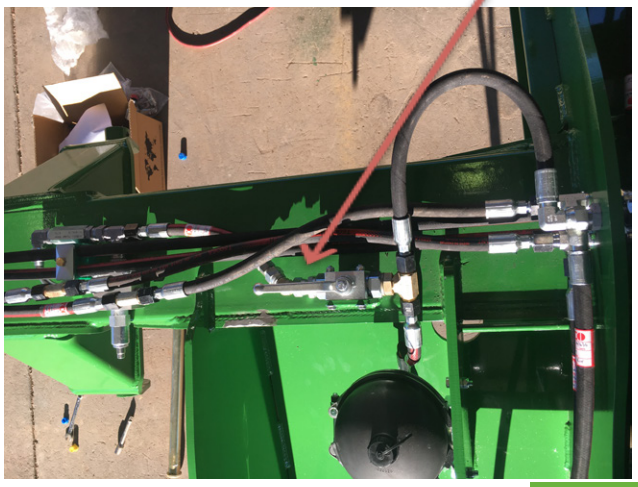
Transport safety lock valves

Fig 1.



Tension isolated valve

Fig 2.



Operation

Setting for correct chain tension

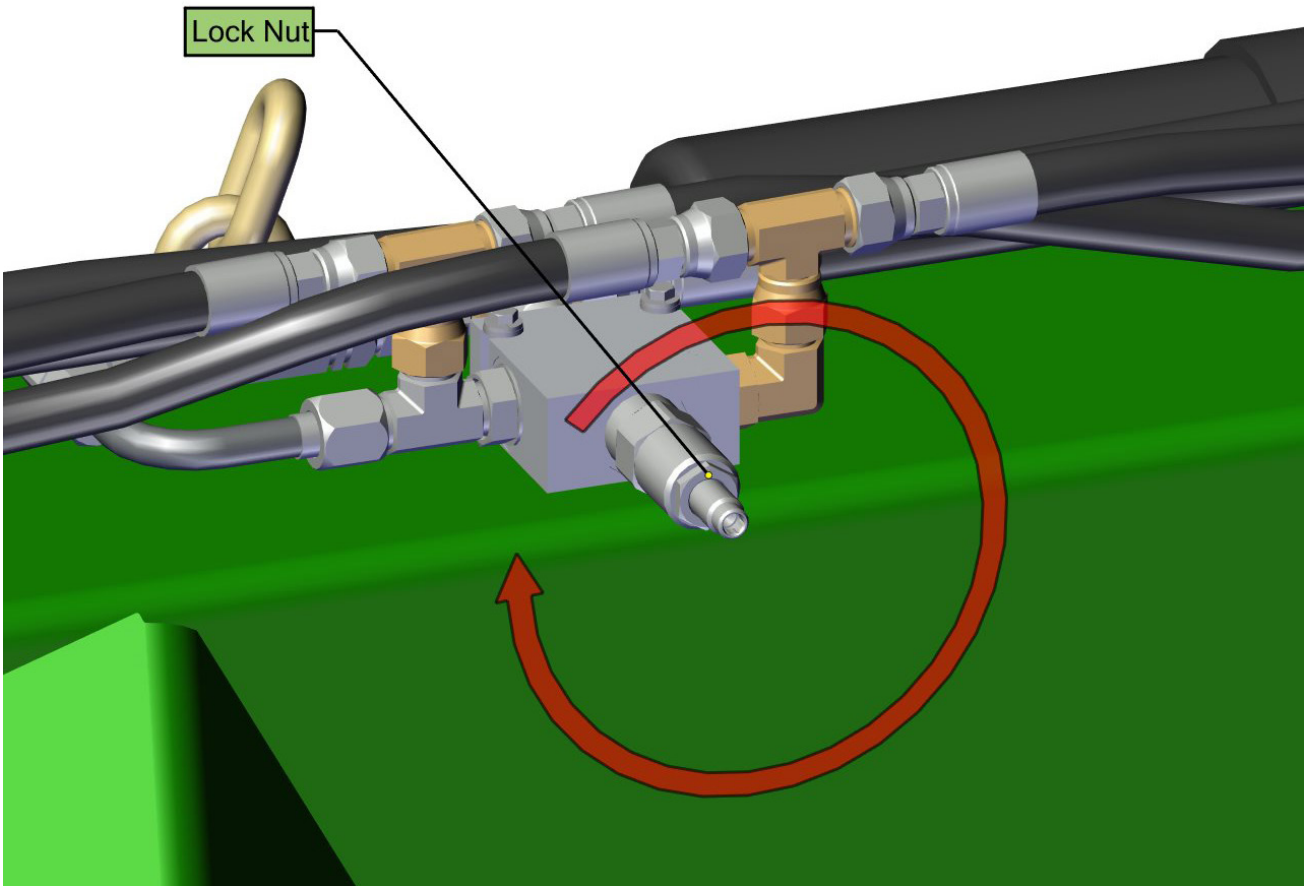
Hydraulic chain tensioning

The chain tension is provided and managed by a combonation of telescope cylinders. Nitogen accumulator and pressure control valve. Pressure is applied to the circuit by the wing unfold action, when appropriate walking pressure is on the gauge the circuit isolated using the tension isolated valve.

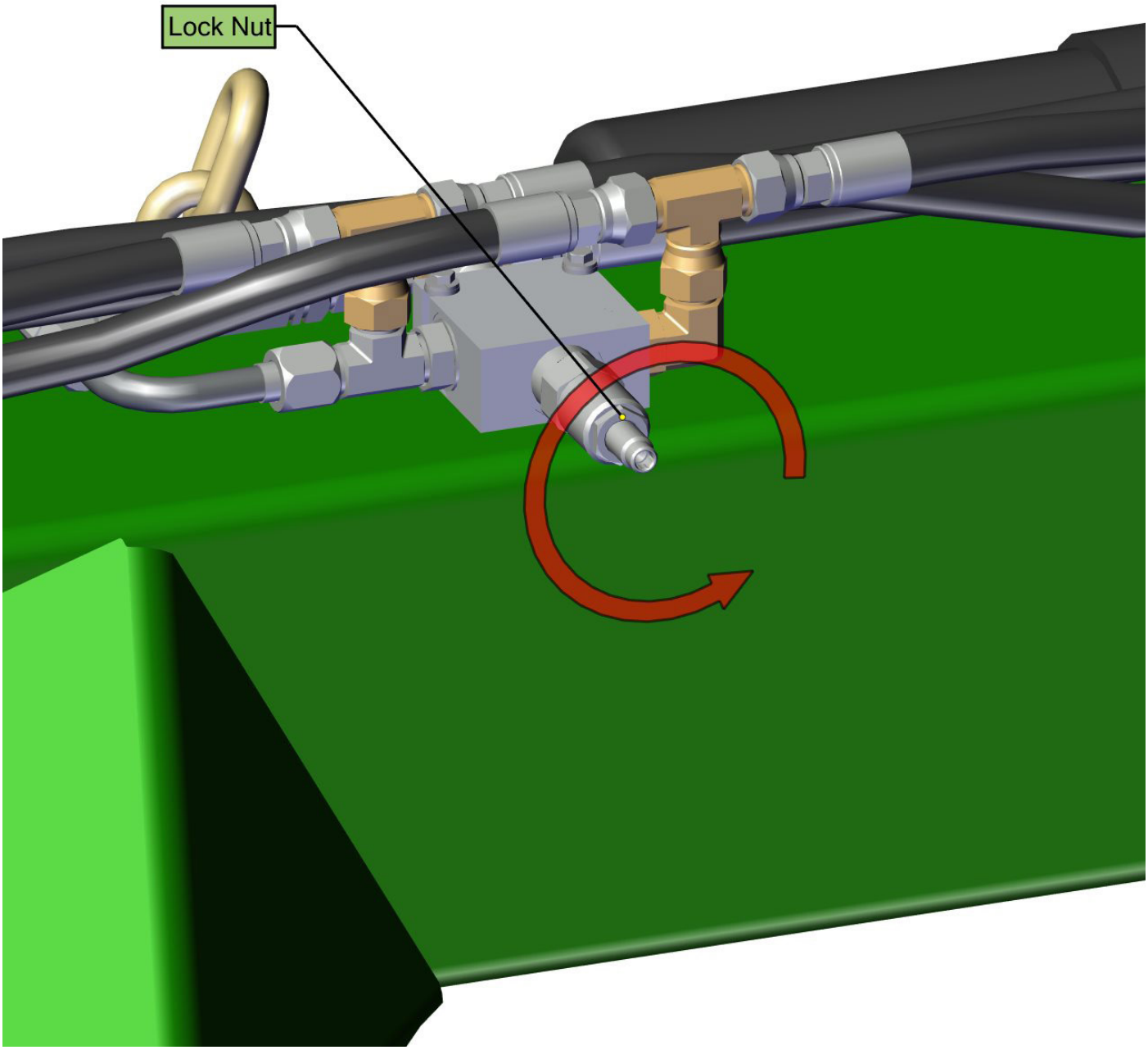
A chain tension pressure of 700-1000 psi is recommended for most situations.
It may however be necessary in different situations to increase or decrease the chain tension.
This can be done via the pressure control valve pictured below.

Loosen the lock nut,
With a the tension isolating valve open and the tractor pressurising the wing unfold circuit use an Alen key to turn the screw in the direction needed for the result required as indicated below.
It may be necessary to wind the screw all the way out then dump all the hydraulic pressure out of the system and the wind the screw in until the desired pressure is reached.
When finished close the tension isolating valve and tighten the lock nut.

Increase tension pressure



Decrease tension pressure



Importance of chain tension

Operational
It is imperative that the correct adjustment be maintained. Only through correct adjustment can a smooth and level finish be achieved in field working.
Loose chains lead to :
• Uneven performance across the width of the machine
• Uneven weed control
• Unsatisfactory incorporation
• Ineffective levelling
• Accelerated or premature chain wear
• Chains failing to engage with transport locators when folded
• Machine damage when folding or unfolding
• Uneven field surface with ridges and furrows being created.

A correctly adjusted machine will not cause this phenomenon.

Operation

Wear

Correct chain tension will ensure that the entire length of discs will roll as one. This minimises the movement between each link. If a chain is not adjusted and runs loose, each link acts as a universal joint as the curved chain rolls along. The wear rate between each link is greatly accelerated and can lead to premature failure. The chain should not wear out before the discs are worn down. ONLY POOR ADJUSTMENT CAUSES THIS.

- The chain may sag not more than 6" (150mm) when working
- At rest there should be less than 4" (100mm) of sag in the chain.

Indicator line shows acceptable curvature when operating

Operation

Settings for correct working height

To adjust the swivel height at the wings, relocate one of the polyurethane spacers either above or below the fixed mounting tube.

Adjustment

1	Loosen chain tension completely (See page18)
2	Undo self tapping screw from corresponding spacer then prise open the spacer and spring it off of the drop leg tube
3	Replace it in the selected position after raising or lowering the drop leg
4	Reinstall the self tapping screw and re-tension the chain

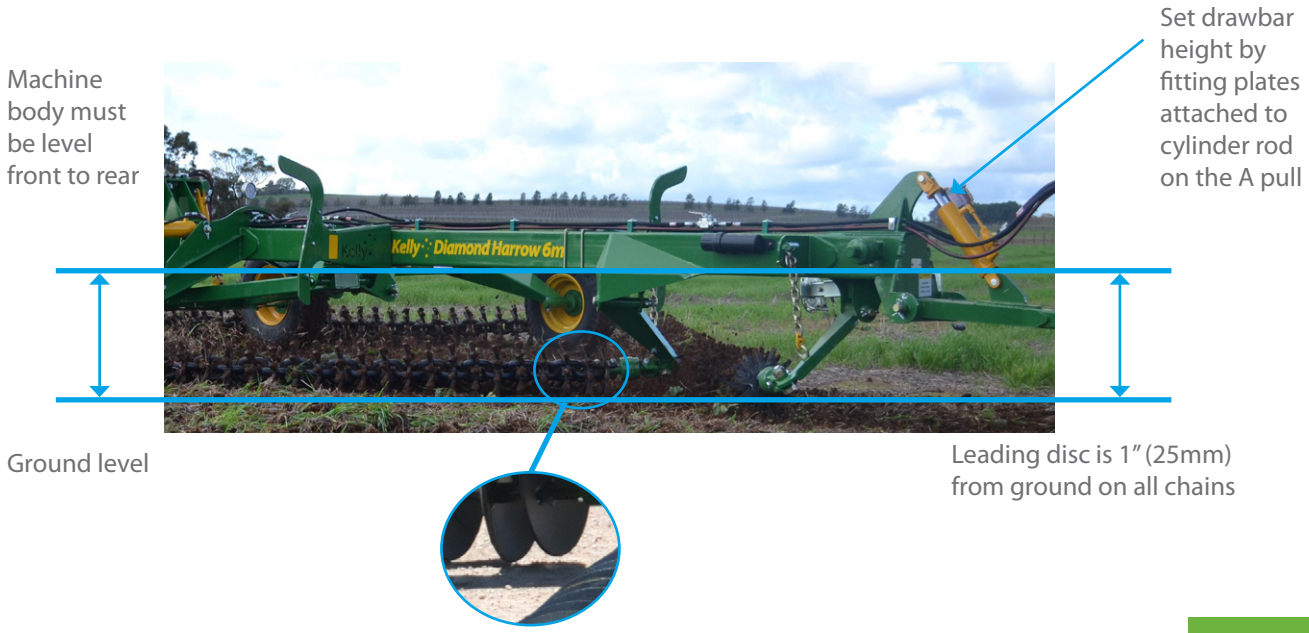
It is possible to install all spacers either above or below the mounting tube giving a maximum of 4" (100mm) of adjustment.

Operation

Chain mount arm height adjustment

Use the tractor hydraulics to raise the frame or chain mount plate that requires adjustment.
Position a suitable block or stand to support the arm.
Using the tractor hydraulics, lower the machine until the height adjusting chains are loose.
Remove spring retaining clip.
Slide chain links through slot in lifting arm, turn links 90 degrees for fine adjustment.
Lift Frame and install retaining clip.
Remove stand.

Front A frame height adjustment



Operation

It is important to spend some time setting up the swivel heights to achieve a good result. It is critical in achieving a level finish that the swivel heights are set correctly.

It is possible with correct adjustment to achieve a level finish in most situations by manipulating the front and rear heights of each chain.

The leading disc on each chain, if set too low has the capability of pushing up a ridge of soil that the following chains may not level out. This can occur at the front of each chain, at the front of the rear chains (widest point) and at the front of the machine (either side of center).

The trailing disc on each chain, if set too low has the capability of leaving a furrow that may not be filled by other chains. Look for this at the rear of each chain, on the wings at the rear of the front chains and at the very rear of the machine near the center line.

There is enough overlap built into the machine to ensure that it is possible to raise the front of all of the chains just clear of the ground and still achieve a full cut.

The optimum setting may vary depending on soil cover. In heavy stubble and unworked ground it is possible to set the swivels low to the ground. In light stubble or loose soil it is best to raise the leading discs so that the chains 'feather in' to the soil.

The main pull and rear tail should both be horizontal. ie parallel to the ground. Fine adjustments should be made using the adjustor chains at each bearing mount plate.

Once the main pull is set correctly apply flip over plates on front cylinder to the rod of the front A pull cylinder. This sets the draw bar height correctly for your tractor.

It is important to note that lowering the swivels will not cause the discs to dig deeper or more aggressively. It will result in premature wear of swivel hardware and the first two chain links. It will also cause ridges and furrows to appear.

Digging effectiveness is a result of soil conditions and disc chain construction. The weight, shape, angle and spacing of the discs are the factors which influence efficacy. On hard dry soils it is unrealistic to expect the discs to dig fully or evenly. They will however still perform well for residue breakdown and seed stimulation.

To prevent injury never lubricate or service Chain Harrow while it is moving (folding up or down or in working motion)

Operation

Maintenance and inspection

Good maintenance is your responsibility

- Before working on machine, ensure all moving parts have stopped
- Always use a safety support and block the wheels
- Use extreme caution when making adjustments
- Replace shields and guards after servicing and before moving
- After servicing, make sure all tools, parts and service equipment are removed
- Where replacement parts are necessary for periodic maintenance and servicing, genuine factory parts must be used. Kelly Engineering will not claim responsibility for use of unapproved parts and other damages as a result of their use and will not be liable for injury or warranty if equipment has been altered in any way
- A fire extinguisher and first aid kit should be kept readily available while performing maintenance.

Intervals

1. After FIRST use

- Visual check after first usage. Check for loose or missing hardware, oil leaks
- Retighten wheel nuts.

2. Daily

- Check chain tension
- Visual check for loose or missing hardware, especially chain/bearing bolts and pin retaining hardware
- Check for oil leaks or damaged hydraulic hoses.
  Immediately after stopping the machine, walk around and check the swivel units. A significant increase in temperature indicates a failing bearing. Replace with the spare swivel unit supplied and rebuild or replace the failed unit. Aproximate operating temperature is 131 deg F (55 deg C). Failure is indicated at approx. 176 deg F (80 deg C).

3. After 25 hours of use

- Grease A frame lift
- Grease wheel lift bush
- Grease wing hinge pins x 2

4. End of season ready for storage

- Ideally cover chain swivels to prevent ingress of water during storage.

Operation

Maintenance and inspection

5. Pre-season. After storage

- Check chain tension
- Visual check for loose or missing hardware, especially chain/bearing bolts
- Check for oil leaks or damaged hydraulic hoses
- Check tire inflation pressures
- Grease all points
- Check chain swivels for free and smooth rotation.
- Check wheel nuts
- Check pivot pins and cylinder pins for wear
- Check and repack wheel bearings and hubs with grease.

Trouble shooting

The majority of Chain Harrow operating problems can be traced to improper adjustment. This trouble shooting section may help you by suggesting a probable cause and a recommended solution.

Symptom	Problem	Solution
Wings bouncing	Wing tire pressure too low	Refer to page 16 for tire pressure specifications
	Operating speed is too fast for field conditions	Reduce speed
Chain Links wearing	Chain too loose. Chain loops back when working.	Check length and adjust to correct tension. See pg 17-19
	Swivel set too close to ground.	Raise to correct height.

Operation

Trouble shooting

Symptom	Problem	Solution
Chain not rotating	Bearing failure in swivel unit	Check and replace
	Front chain swivels on machine too low Foreign material fouling bearings	Lift front swivels using adjustors / front cylinder Clear foreign material from the chains, especially around bearings
Uneven tread wear on transport wheels	Tire pressure too low Excessive road speed	Inflate to correct pressure See table pg 27 Travel at prescribed speed
Chains not locating properly on chain hangers	Chain out of adjustment - too slack	Adjust chain tension
Operation leaves central ridge behind machine	Front chain swivels are too low	Raise front swivel/s
Operation leaves central furrow behind machine	Rear chain swivels are too low	Raise rear swivels
Ridging on outside edge of machine	Leading end of corresponding rear chain is too low 5'	Raise corresponding wing swivel v
Furrow on outside edge	Rear of front chain set too low	Raise corresponding wing swivel

Never attempt to fold for transport if the chain is clogged with weeds or mud as the extra weight may damage hydraulics or frame

Section 3
Specifications

Specifications

Operating speeds

Operating speeds for normal conditions	
Chain type	**Speed**
Prickle Chain	6-10 Mph / 10-16 kmph
Disc Mulch Chain	6-8 Mph / 10-12 kmph
Transport / towing on roads	15 Mph / 25 kmph

Tire pressure

Tire size	Ply	PSI	KPA
11L - 15	10	44	300
15.5/80/15.3	14	36	250

Chain Harrow specifications

Model	20'/6m
Working width	21.3'/6.5m
Transport width	8.2'/2.47m
Transport height	113.2'/4m
Transport length	34.5'/10.5m

Disc chain lengths

Model		Length	W36	CL1	R300	SD49	CL2
20'/ 6m	**Front right**	14.8'/4.5m	26	27	36	36	37
	Front left	14.5'/4.5m	26	27	36	36	37
	Rear right	14.5'/4.5m	26	27	36	36	37
	Rear left	15.4'/4.7m	27	28	37	37	37

Bolt Torque Settings

Bolt Type	Wheel nut				U Bolt			Grade 8.8 Bolt					Grade 10.9 Bolt	
Bolt Size	M18	M20	1/2"	9/16"	M10	M12	M16	M10	M12	M16	M20	M24	M20	M24
Ft lb	255	265	90	100	22	36	55	32	48	140	190	270	300	350
Nm	345	360	125	140	30	50	75	44	65	190	260	370	406	475

[1] When fitting a wheel & tire to a hub, do the wheel nuts up in rotation to the correct tension. To achieve this choose a wheel nut & tighten, then go clockwise to the next wheel nut & tighten & so on until all wheel nuts are tight. Then repeat the procedure to check that all nuts are tight. Do not use impact tools to tighten wheel nuts. For a guide to the correct tension of the wheel nuts please use the appropriate tension for your size wheel nuts from the Bolt Torque Settings table.

Torque values are for dry threads and surfaces however it is permissible to apply a small amount of anti corrosive oil to the threads.

Notes