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# Operator's Manual

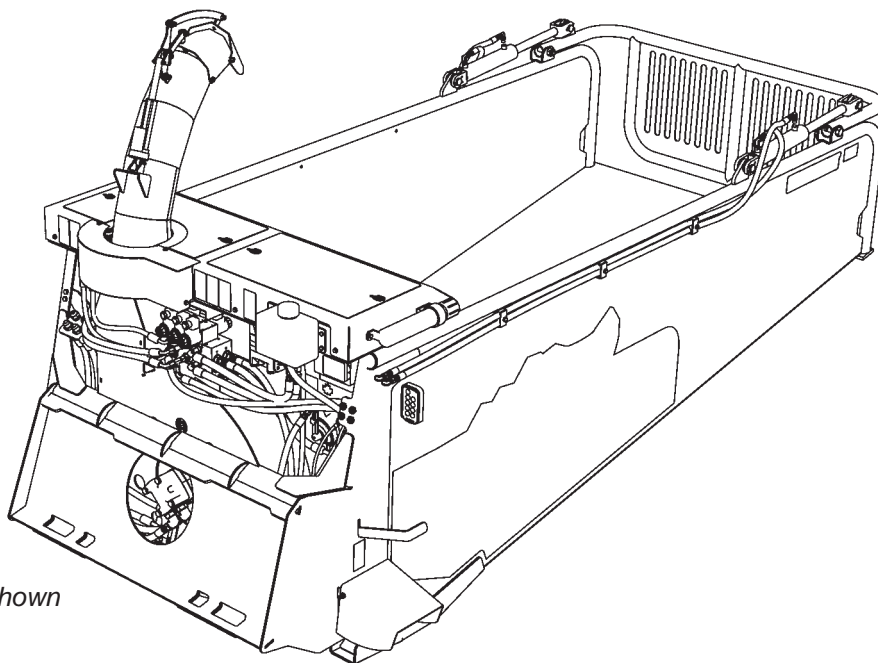
Keep this manual with the machine at all times.

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Bale Processor

## Bale Gator



*\*348 model shown*

# Operator's Manual

Thank you for choosing the Tubeline Bale Gator. We know that it will give you many years of productive service. Please read and understand this manual and the machine before operation. This manual covers all available models. The latest manual version can be found at [www.tubeline.ca/support.php](http://www.tubeline.ca/support.php).

## Warranty and Limitation of Liability

All equipment is sold subject to mutual agreement that it is warranted by the company to be free from defects of materials and workmanship. But the company shall not be liable for special, indirect or consequential, damages of any kind under this contract or otherwise. The company's liability shall be limited exclusively to replacing or repairing without charge, at its factory or elsewhere, at its discretion.

Any material, or workmanship defects which become apparent within one year from the date on which the equipment was purchased, and the company shall have no liability for damages of any kind. The buyer by the acceptance of the equipment will assume all liability for any damages, which may result from the use or misuse by his employees or others.

Warranty coverage is null and void unless Warranty Registration form has been completely filled in and is on file at Tubeline Manufacturing Ltd.

## Serial Plate Location

The implement serial number is located above the flow control, *see below*. This number helps us to track changes and improvements and must be mentioned when ordering parts or requesting service. For your convenience, a space has been provided inside the front cover of this manual to record the serial number, model number, purchase date, and dealer name.

Model No: Bale Gator

☐ 334

☐ 346

☐ 348

Serial No: \_\_\_\_\_

Date Purchased: \_\_\_\_\_

Dealer Name: \_\_\_\_\_

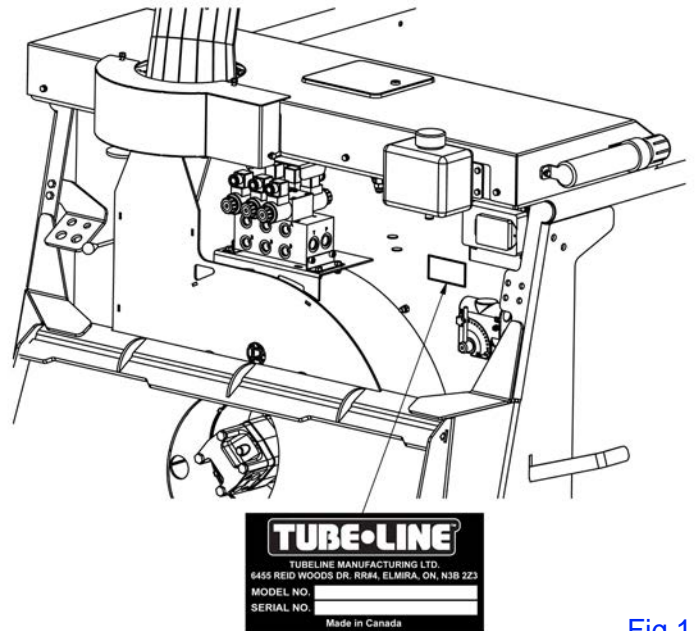


Fig.1

<b>TUBE•LINE™</b>	
TUBELINE MANUFACTURING LTD.	
6455 REID WOODS DR. RR#4, ELMIRA, ON, N3B 2Z3	
MODEL NO.	_____
SERIAL NO.	_____
Made in Canada	

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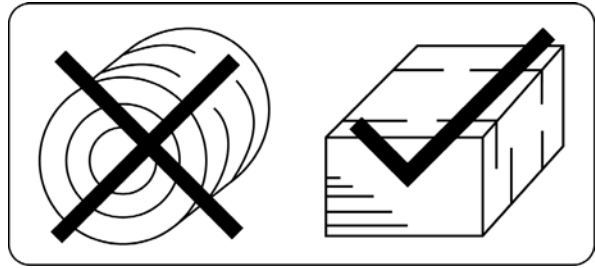
# Section 1 - Introduction

The **Bale Gator Series** is carefully designed and manufactured to give you many years of dependable service. You or any other person, who will be assembling, operating, maintaining or working with this product, are required to read and completely understand the information and instructions contained in this manual. If anyone does not fully understand every part of this manual, please obtain further assistance by contacting the dealer from which this product was purchased or by contacting Tube-Line at the telephone number or address listed on the cover page of this manual. Keep this manual available for reference whenever this product is being handled or used. Provide this manual to any new owners and/or operators.

## Bale Sizes

Tubeline Bale Gator series machines can load and shred all types of forage in square bales.

Model	Maximum Bale Size (LxWxH)
334	48"x36"x36" (193cm x 91cm x 91cm)
346	72"x48"x36" (183cm x 122cm x 91cm)
348	96"x48"x36" (244cm x 122cm x 91cm)



## Uses

The Tubeline Bale Gator primary use is to spread bedding material and erosion control.

## Power Unit Specifications

**NOTE:** Exceeding any of the recommended power unit specifications can damage your power unit and/or this product and WILL void all Tubeline warranties.



Model	Required Pressure	Horse Power
334	8-12 GPM @ 3000 PSI	18-50 HP
346	22-30 GPM @ 3000 PSI	45-65 HP
348	22-30 GPM @ 3000 PSI	70-90 HP

**WARNING:** This machine requires a case drain to operate. Failure to operate with one will lead to damage to hydraulic components. This will void the warranty.

This machine requires a 12V DC (10amp) connection. On board batteries are also available.

## Machine Weight

Model	Weight
334	800 lbs (363kg)
346	1450 lbs (658kg)
348	1800 lbs (817kg)

## Terminology & Orientation

Fig.2

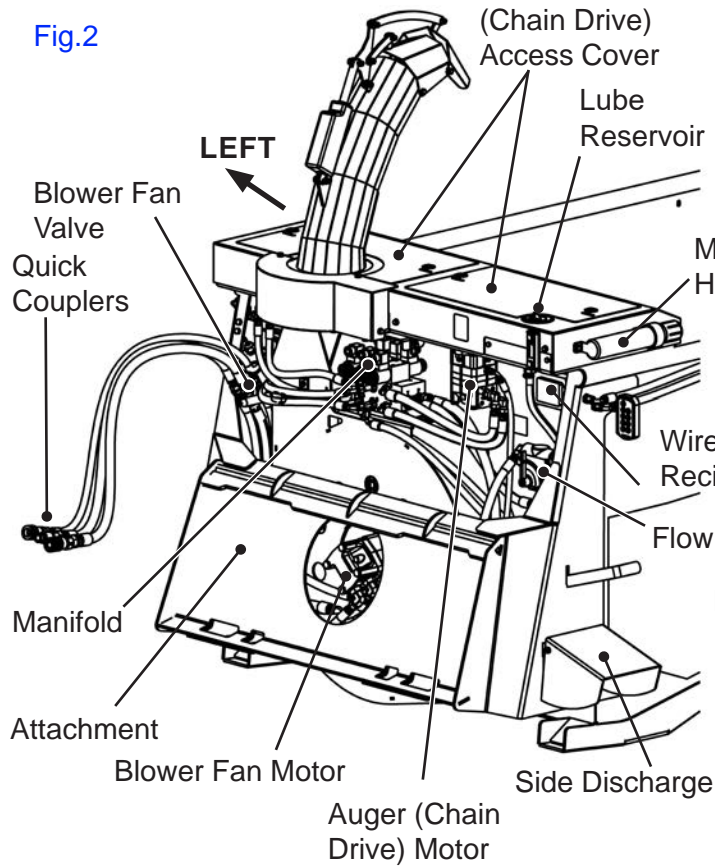
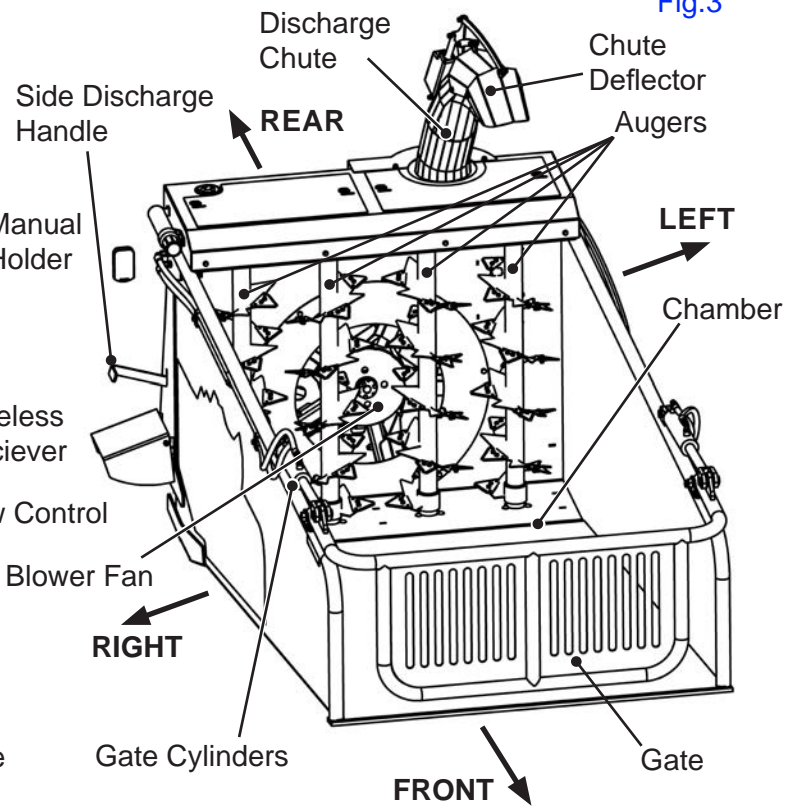
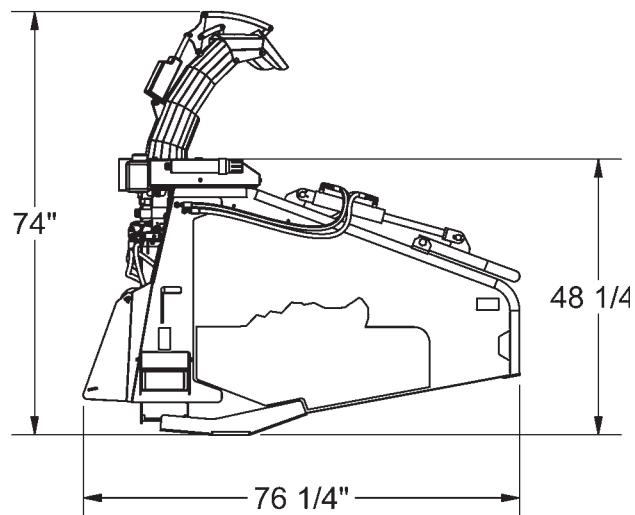
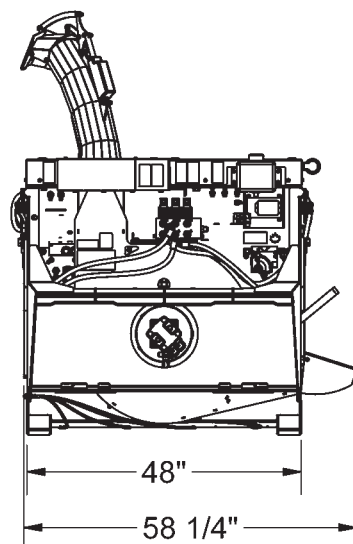
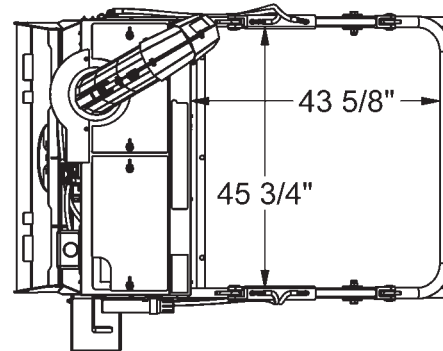


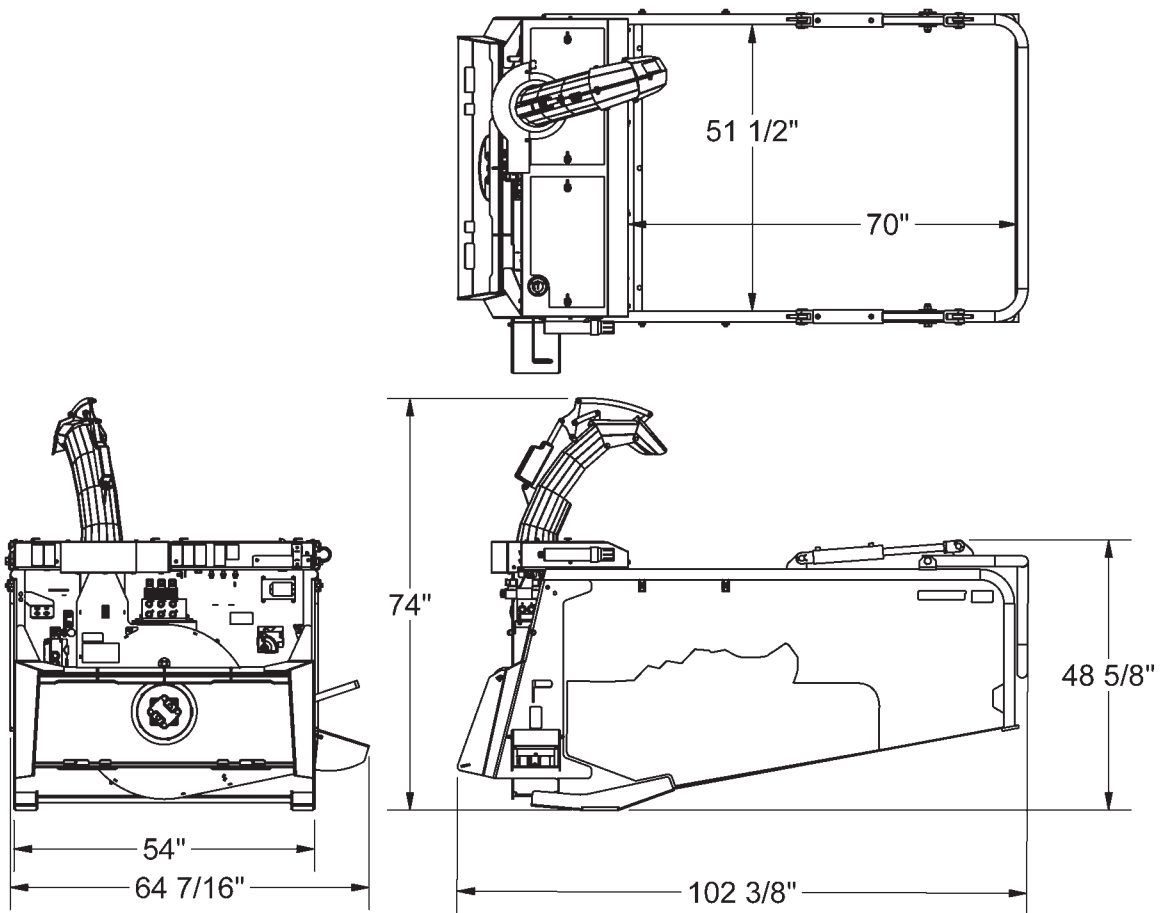
Fig.3



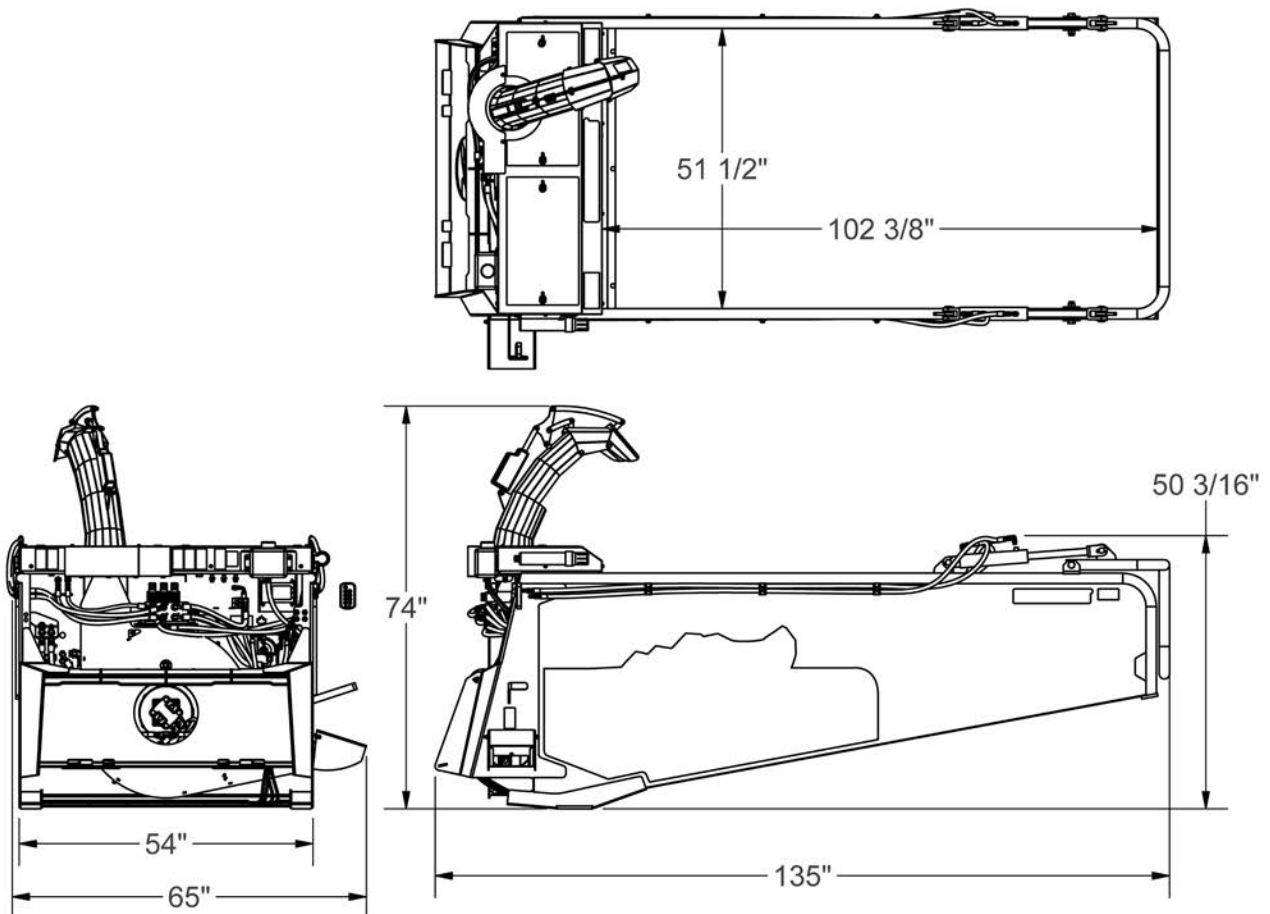
## Dimensions - 334



### Dimensions - 346



### Dimensions - 348





## Section 2 - Safety

**NOTE:** This safety alert symbol is found throughout this manual to call attention to instructions involving yourself and others working around the machine.

Failure to follow these instructions can result in injury or death.



This symbol means:

**Attention!**

**Become Alert!**

**Your Safety is involved!**

### Safety Words / Safety Messages

**CAUTION:** Indicates a potentially hazardous situation that may result in injury.

**WARNING:** Indicates a potentially hazardous situation that could result in serious injury or death.

**DANGER:** Indicates a hazardous situation that needs to be avoided. Operator needs to be aware of these dangers. High probability of serious injury or death.

**NOTE:** Indicates an informative non-safety related message.

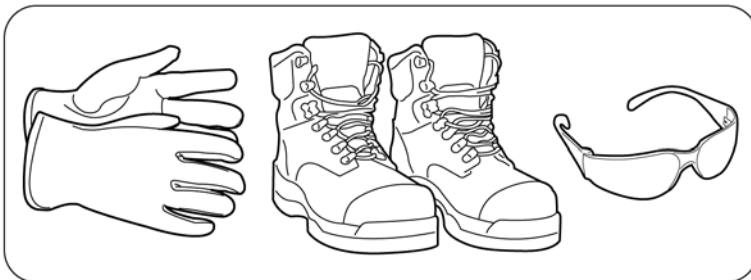
### Safety Guidelines

Take the necessary precautions to avoid injury or death. These include:

- Reading and understanding this manual before operating.
- Have training and train new operators.
- Review the safety instructions with all users annually.
- Know where safety decals are and what they convey.
- **DO NOT** paint over, remove or deface any safety signs or warning decals on your equipment.
- Replace damaged and/or missing safety decals.
- **DO NOT** operate without fully installed shields.
- Reinstall any removed shields **BEFORE** operating.
- Inspect machine before operating.
- **DO NOT** operate this machine while under the influence of drugs or alcohol.
- **DO NOT** let children ride or operate this machine.



## Personal Protective Equipment



**WARNING:** Wear work boots, gloves, and safety glasses when maintaining or repairing machine.

**WARNING:** Wear work boots and ear protection when operating machine. Wear a dust mask when operating in an enclosed space.

**DANGER:** Secure loose clothing, hair, accessories, etc before operating or maintaining the Bale Gator.

## Maintenance Safety

Know and follow good work practices when assembling, mounting, maintaining, repairing, removing and storing this product:

- Work on a level surface in a clean, dry and well lit area.
- Use properly grounded electrical outlets and tools.
- Use the right tool for the job at hand.
- Make sure that your tools are in good condition to perform the necessary function.

### **WHEN YOUR POWER UNIT IS USED DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE OR OTHER WORK ON OR NEAR THIS PRODUCT:**

Before leaving the operator's station or before beginning any type of work on this product, lower this product to the ground, apply your power unit's parking brake, stop the engine, remove the starter key, wait for all moving parts to stop and then relieve all pressure in the hydraulic lines.

**NOTE:** Refer to your power unit's operator's manual for instructions on how to relieve hydraulic pressure in lines.

Know your loader's safe lifting and operating capacity and the weight of this product. See the specifications in this manual for the weight of this product and refer to your power unit's and loader's operator's manuals for safe operating limits. Lift capacity may be reduced if using a quick-attach.

Never allow anyone, except the operator, to be around the power unit or this product when either is in motion. Do not start up unless others are clear of the work area. Do not allow riders on this product or the power unit. Do not stand or climb on this product when raised. Do not place any part of your body under any part of this product unless this product is securely resting on adequate blocking or on the ground.

Do not use blocking made of concrete blocks, logs, buckets, barrels or any other material that could suddenly collapse or shift positions. Do not use wood or steel blocking that shows any signs of material decay. Never operate controls from the ground. Operate the controls only from the operator's station. Never leave the equipment unattended with the engine running or with this product raised on the loader.

## Transport Safety

- Be aware of the added weight and width of this product.
- Reduce travel speeds accordingly, especially when traveling over rough ground.
- Keep this product close to the ground and under control when transporting.
- When transporting, be sure processor does not block view of vehicle lights or road.



## Hydraulic Safety

**WHEN DEALING WITH HYDRAULICS DURING ANY TYPE OF ASSEMBLY, OPERATION, MAINTENANCE OR OTHER WORK ON OR NEAR THIS PRODUCT:**

Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death. Hydraulic leaks under pressure may not be visible. Wear safety glasses, protective clothing and use a sound piece of cardboard or wood when searching for hydraulic leaks. **DO NOT USE YOUR HANDS!** If any fluid penetrates the skin, **SEEK IMMEDIATE MEDICAL ATTENTION!**

Before connecting or disconnecting hydraulic hoses, read your tractor or power unit's operator's manual for detailed instructions on connecting and disconnecting hydraulic attachments. Make certain that all parts meet the specifications for this product when installing or replacing hydraulic hoses or fittings. After connecting hydraulic lines: Slowly and carefully raise the loader and cycle the rollback / dump cylinders to check hose clearances and to check for any interference. Operate the hydraulics on this product to check hose clearances and to check for any interference. Make certain that the hoses cannot interfere with or actuate the quick-attach mechanism. Make certain that hoses will not be pinched, or get tangled, in any equipment. Do not lock the auxiliary hydraulics of your power unit in the "ON" position.

Refer to your power unit's operator's manual and this manual for procedures and intervals, then inspect and maintain the entire hydraulic system to insure that the fluid remains clean, that all devices function properly and that there are no fluid leaks.

## Section 3 - Decal Locations

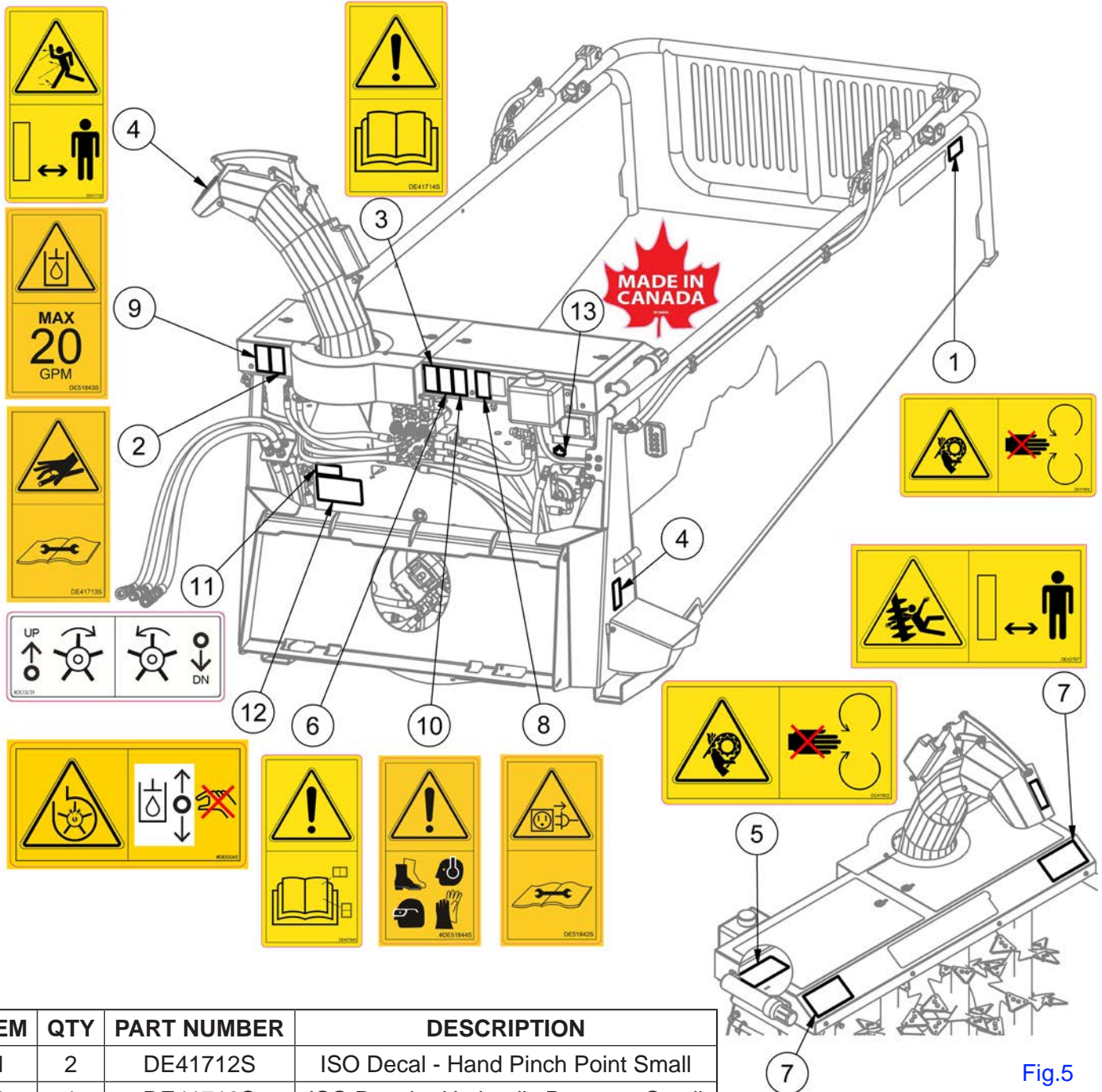


Fig.5

ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	DE41712S	ISO Decal - Hand Pinch Point Small
2	1	DE41713S	ISO Decal - Hydraulic Pressure Small
3	1	DE41714S	ISO Decal - Read Operator's Manual
4	2	DE41718S	ISO Decal - Hydraulic Pressure Small
5	1	DE41902	ISO Decal - Chain Entanglement
6	1	DE42784S	ISO Decal - Read OM Decal Section
7	2	DE42787	ISO Decal - Nitro Beater Entanglement
8	1	DE51842S	ISO Decal - Disconnect Power Small
9	1	DE51843S	ISO Decal - Max 20GPM Small
10	1	DE51844S	ISO Decal - ISO Use PPE Small
11	1	DE53239	Blower Fan Direction Decal
12	1	DE53240	ISO Decal - Vertical Lock
13	1	DECANADA	Decal Made In Canada

## Safety Decal Descriptions

Item 1: DE41712S



Keep clear of machine while operating. Do not attempt to free material by hand. May result in serious injury and/or death.

Item 2: DE41713S



Do not attempt to find hydraulic leaks with hand. Consult operators manual ([pg.7-1](#))

Item 3: DE41714S



Read and understand Operator's Manual before operating.

Item 4: DE41718S



Thrown object hazard. Keep clear of machine while operating. Serious injury may occur.

Item 5: DE41902

Chain Entanglement Hazard. Keep hands clear of rotating parts while machine running. Do not operate without shielding in place.



Item 6: DE42784S



Read Operator's manual decal section to understand safety decals.

Item 7: DE42787

Stand clear of rotating beaters to avoid entanglement. Serious injury or death hazard.



Item 8: DE51842S



Disconnect machine power source before servicing.

Item 9: DE51843S

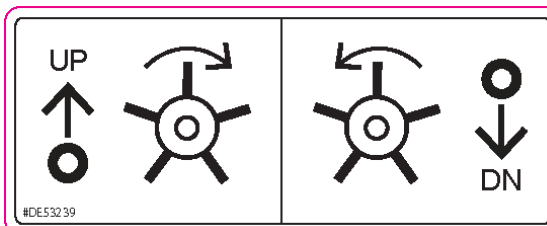


Disconnect machine power source before servicing.

Item 10: DE51844S



Wear the proper personal protective equipment when operating this machine.



Item 11: DE53239

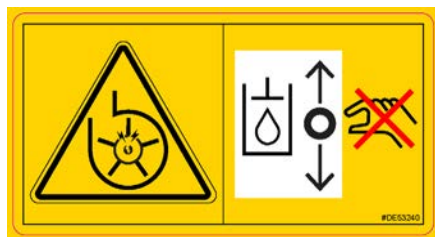
Push selector valve handle upwards to make blower fan rotate clockwise.

Push selector valve handle downwards to make blower fan rotate counter-clockwise.



### Item 12: DE53240

Moving selector valve handle while blower fan rotating will damage the motor driveshaft.



### Item: 13 Part No: DECANADA

Country of Origin.



## Placement or Replacement of Decals

Clean the area of application with non-flammable solvent, then, wash the same area with soap and water. Allow the surface to fully dry. Remove the backing from the safety sign, exposing the adhesive surface. Apply the safety sign to the position shown in the diagram above and smooth out any bubbles.

- Keep all safety signs clean and legible.
- Replace all missing, illegible or damaged safety signs.
- Replacement parts for parts with safety signs attached must also have safety signs attached.
- Safety signs are available free of charge from your dealer or from Tube-Line.

## Section 4 - Functions & Adjustments

### Remote Transmitter to Receiver Synchronization

There are over 64000 different addresses (ID codes) available for each transmitter and receiver pair. Each transmitter and receiver pair is synchronized together at the factory. If a new transmitter is needed, synchronizing is required use the following procedure:

1. Turn both transmitter and receiver off.
2. With the transmitter off, press and hold the POWER button for more than 10 seconds. LEDs start blinking.
3. Turn on the receiver.
4. Teach complete.

### Remote Control Functions

With the wireless handheld electrical control positioned as shown in Fig.6, the three toggle switch functions are:

- Power button (A): Press to turn on remote, a rapid green pulse from the network light (B) indicates remote is connected to machine receiver. A red pulse from the battery level light (C) indicates the remote needs to be charged via its micro-USB port.
- Auger Forward (D): Press button to start the augers rotating towards the bale. Press button again to stop the augers.
- Auger Reverse (E): With augers rotating forward, pressing this button once will stop augers rotation. Press button again to run the augers in reverse to clear a clog.
- Endgate Open (F): Press and hold button to raise the endgate.
- Endgate Close (G): Press and hold button to lower the endgate.
- Chute Rotate Left (H) and Right (I): Press and hold button to rotate chute towards the left or right.
- Chute Deflector Up (J) and Down (K): Press and hold button to raise or lower the chute deflector to increase or decrease the spread distance.

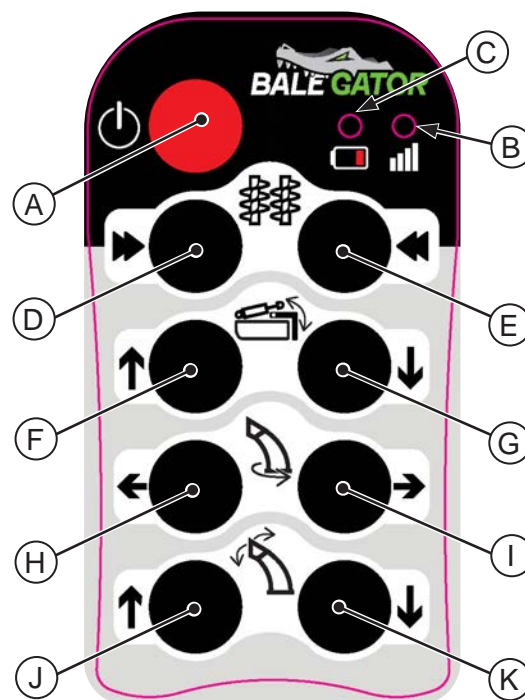


Fig.6

### Blower Fan Speed

The adjustable flow control located on the right mounting side of the machine controls the blower fan speed and thus the material spread distance. The dial is numbered 0-10. For optimal spread consistency and to avoid clogging the fan, adjust within the 8-9 range, do not be lower below 6 for discharge chute operation. Do not set below 3.5 for side discharge operation.

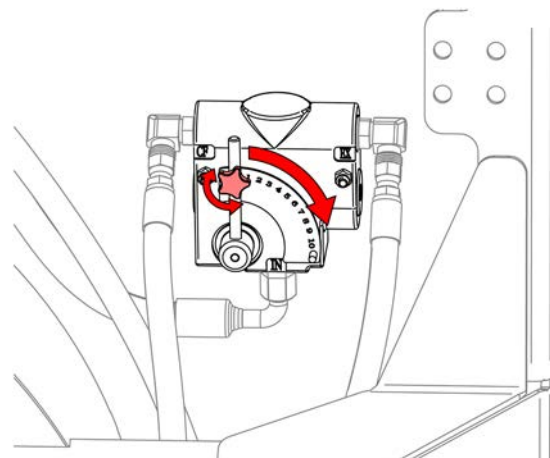


Fig.7

## Blower Fan Direction

Changing the direction of the blower fan switches the discharge method between chute spreading or side spreading.



**WARNING:** To avoid damaging blower fan motor's driveshaft, do **NOT** switch fan direction while fan is moving.

For top chute spreading, push the fan rotation valve handle **(A)** in Fig.8 fully **UP** to spin the fan clockwise (from power unit seat), **(B)** in Fig.9.

For side discharge spreading, push the fan rotation valve **(A)** in Fig.8 fully **DOWN** to spin the fan counter-clockwise, **(C)** in Fig.9.

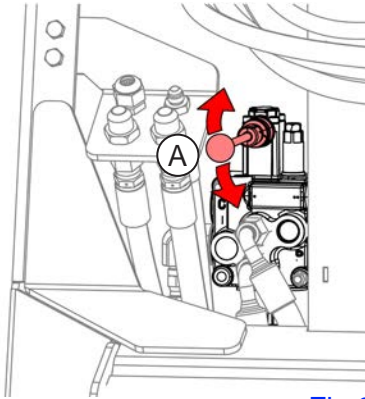


Fig.8

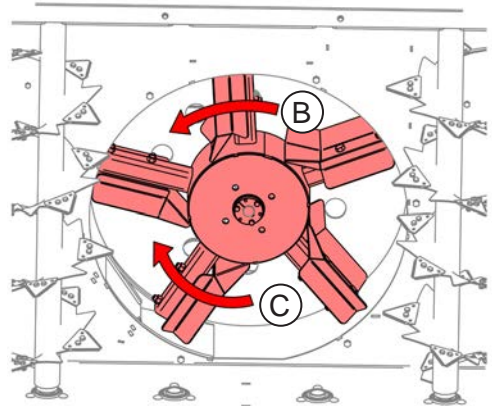


Fig.9

## Chain Tension

Occasionally the chain tension may need to be adjusted. Check chain tension every 20 operating hours.

1. Lift and turn 90° the two latches **(A)** to allow shields **(B)** to be removed from top of machine.
2. Turn nuts **(C)** left or right until correct chain slack is achieved. See Fig.11.
3. Tighten outer nut against inner nut to lock in position.
4. Reinstall shields before operating machine.

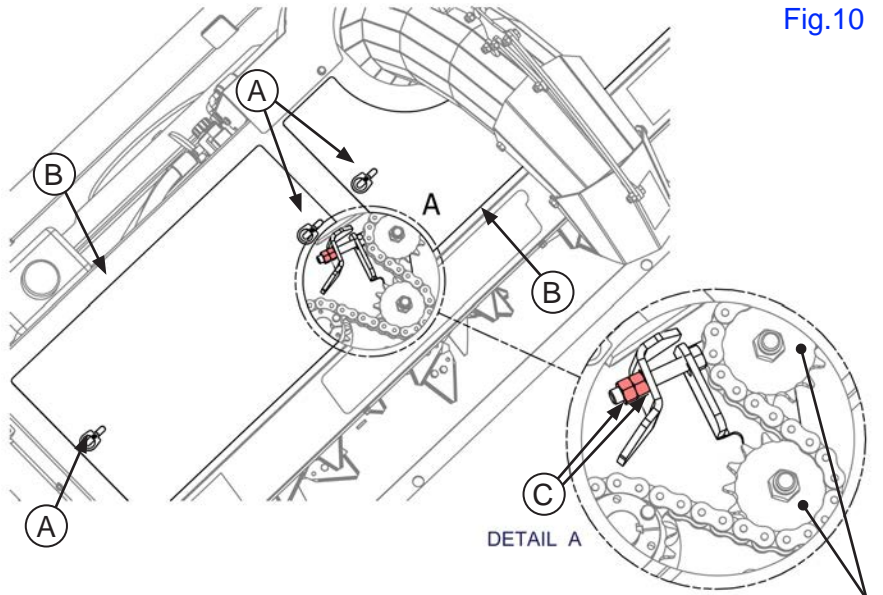
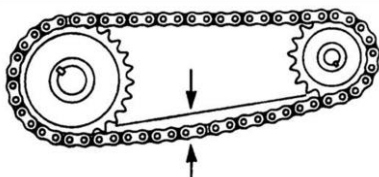
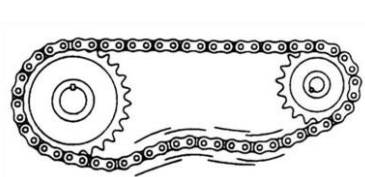


Fig.10

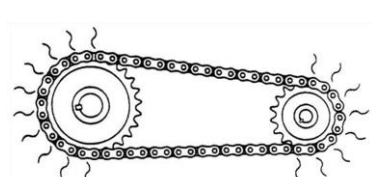
Chain tightener sprockets



Correct Tension - 1/4" slack



Tension - Too loose



Tension - Too tight

Fig.11



## Section 5 - Processor Operation



### DANGER

Failure to obey the following procedure will result in death or serious injury. Avoid contacting overhead wires.

### WARNING

Failure to obey the following procedures could result in death or serious injury.

Use caution when raising loaded machine. Objects could fall from processor toward bystanders or operator.

Remove all foreign objects and twine from bales before processing.

### Processor Installation Instructions

Refer to the operator's manuals of your power unit, your loader and your quick-attach for special or detailed mounting instructions. This product should fit onto the quick-attach or loader arms of your power unit the same as the original products that were designed by your loader / quick-attach manufacturer. If this product does not fit properly, contact Tube-Line before operating.



**WARNING:** Never place your finger into the mounting plate or 3-point hitch or loader holes. A slight movement of the power unit or this product could cause serious injury.

- Make certain that all safety signs are in place and legible. Refer to the safety sign page, [pg.3-3](#) in this manual for the placement of safety signs for this product.
- Replace all damaged or excessively worn parts and hardware only with genuine Tube-Line parts or with properly rated fasteners, hydraulic hoses or fittings.
- Make certain that all locking pins, latches and connection devices are properly installed and secured. Make certain that all shields are in place and secure.
- Never use processor on a power unit that is not equipped with a cab or ROPS, and operator restraints (seat belts or equivalent devices).
- Place this product on a firm, level surface that is large enough to safely accommodate this product, your power unit and all workers involved in the mounting process. Be sure all connection points are properly secured.
- Refer to the operator's manual(s) for your power unit, loader and quick-attach and follow the mounting instructions contained therein.
- Carefully raise the loader arms and cycle the tilt cylinders to check clearances and to verify that all mounting procedures have been successfully completed.
- Drive slowly through gates and doors.
- Know your loader's safe operating weight limit and the weight of your loader attachment.

**NOTE:** Refer to your power unit's operator's manual for safe operating limit and use of counterweights.

## Power Unit Connection



**WARNING:** Read and understand [Section 2 - Safety](#) before beginning any hydraulic connection.

Attach Bale Gator quick couplers to your power unit as per the instructions in your power unit's operator's manual. Do **NOT** operate without a case drain. Electrical connection requires a 12V plug, your preferred plug can be chosen at time of order.

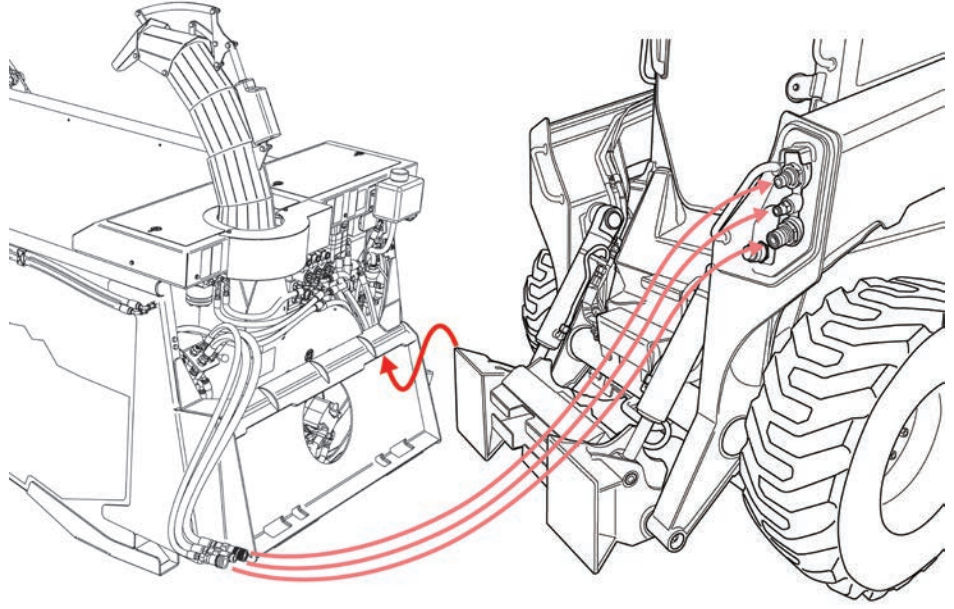


Fig.13

## Loading Bales



**WARNING:** To avoid damaging augers, they must be stopped while loading bales.

1. Engage auxiliary hydraulic function on skid steer.
2. Open the gate **(A)** by pressing and holding the Gate Open button on the remote.
3. After gate is open, slowly roll Bale Gator forward and lower to the ground before scooping into bale.

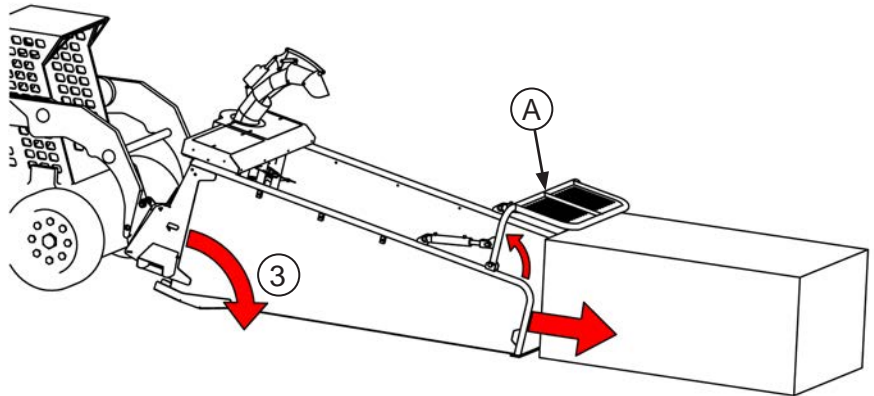


Fig.14

**NOTE:** Place the bale against a concrete wall to prevent bale from being pushed away when trying to load on surfaces like loose gravel.

4. When bale is loaded roll attachment back enough to slide the bale in enough to close the gate, see [Fig.14](#).
5. Turn auxiliary hydraulics off and set parking brake before dismounting operator station to remove strings from bale.
6. Remove strings from bale.

## Top Discharge Chute Spreading

**NOTE:** Ensure side discharge gate is closed before using top discharge chute. See Fig.19.

**CATION:** Ensure Bale Gator is rolled forward before engaging augers. Material weight on the augers can cause over relieving of augers, leading to plugging.

1. Ensure fan rotation valve to the UP position to spin the fan clockwise, refer to [Blower Fan Direction, pg.4-2](#).

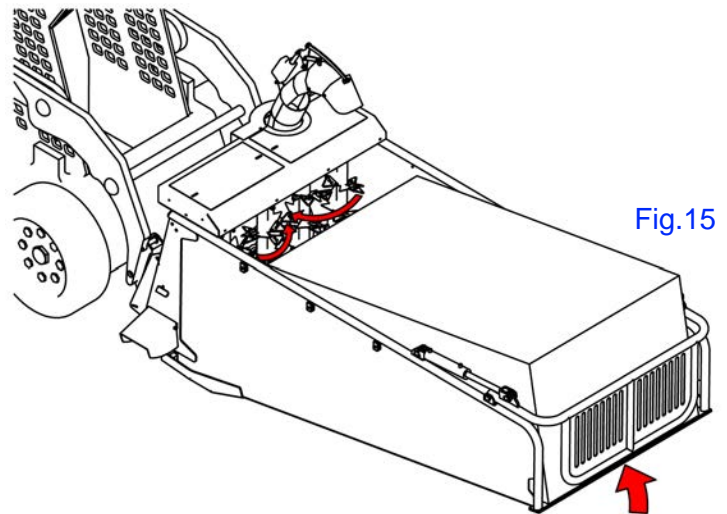


Fig.15

2. Slide discharge chute gate (A) to open.

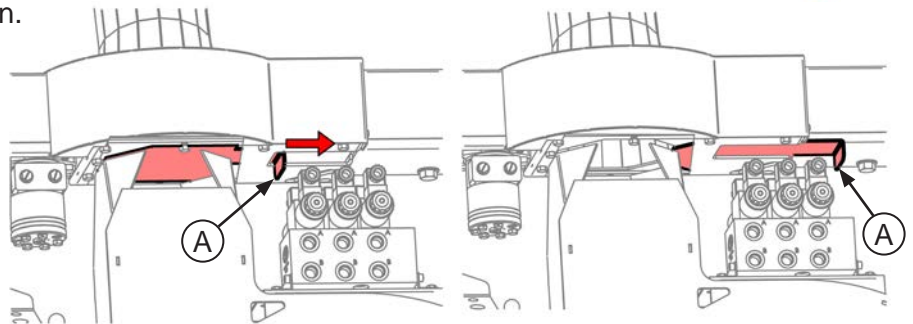


Fig.16

3. Engage auxiliary hydraulic function on power unit.
4. Run power unit at full RPM before introducing material to augers.
5. Use handheld remote to rotate the chute (B) and deflector (C) to desired location before applying a uniform layer of bedding.
6. With augers engaged and engine running at full RPM slowly roll the Bale Gator back. Gravity will pull material against the augers.
7. Upon job completion, disengage auxiliary hydraulics before driving, parking skid steer, and dismounting operators' station.

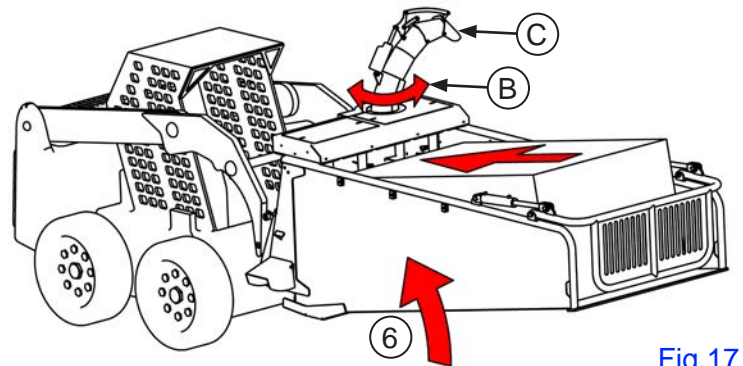
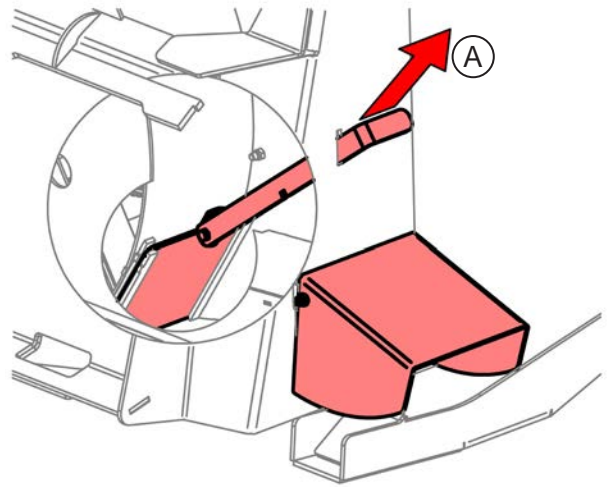


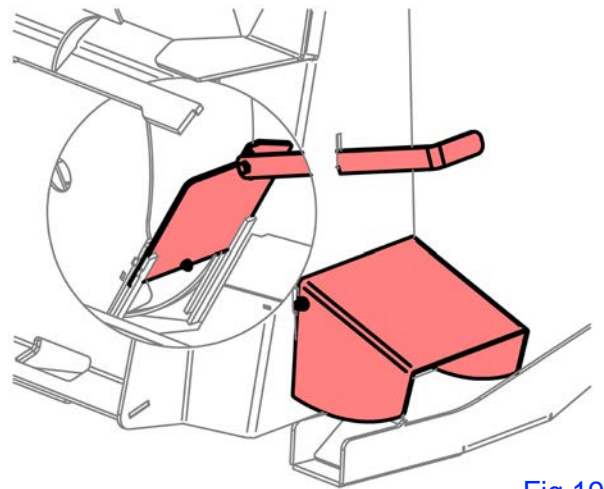
Fig.17

## Side Discharge Spreading

1. Close discharge chute gate, see [Fig.16](#).
2. Pull gate lever **(A)** [Fig.18](#) to allow material through the side discharge.
1. Ensure fan rotation valve to the DOWN position to spin the fan counter-clockwise, refer to [Blower Fan Direction, pg.4-2](#).
2. Engage auxiliary hydraulic function on skid steer.
3. Run skid steer at full RPM before introducing material to beaters.
4. With augers engaged and engine running at full RPM slowly roll the Bale Gator back. Gravity will pull material against the beaters.
5. Upon job completion, disengage auxiliary hydraulics before driving, parking skid steer, and dismounting operators' station.



[Fig.18](#)



[Fig.19](#)

## Section 6 - Processor Maintenance

Regular maintenance is the key to long equipment life and safe operation. It is very important that these maintenance functions be performed as described below.



**SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS ([Section 2](#)) BEFORE BEGINNING ANY PROCESSOR MAINTENANCE OPERATION**

### Before First Use

Inspect the attachment for shipping damage. If damage does exist, do not operate until the damaged parts have been replaced or repaired.

### Before Each Use

Check for loose or badly worn parts.

Make sure that all hydraulic fittings are tightened and that there are no leaks in any fittings or hoses.

Inspect rotor and all rotating parts for twine or wire build-up.

Check for cylinder wear and broken/ worn knives. Replace if needed.

Make sure that all safety signs are in place, are clean and are legible. Refer to Safety Sign Section, [pg.3-1](#).

### After Every 10 Hours of Operation

Grease all roller bearings, see [pg.6-3](#).

Inspect and tighten Allen screws on bearings.

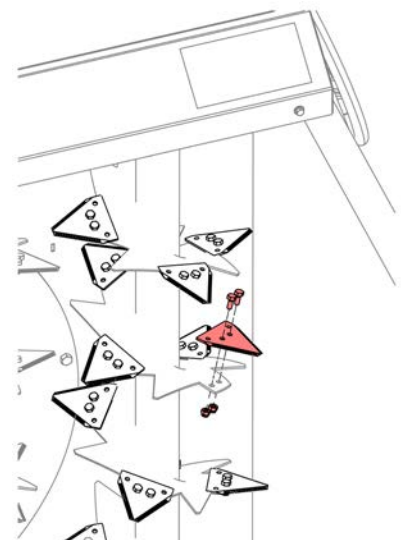
### Repairs

When making repairs, use only genuine Tubeline parts or, for fasteners, hydraulic hoses or hydraulic fittings, use only properly rated parts.

Order safety decals for replacement parts that have a safety decal on the original part.

### Replacing Auger Knives

Replace beater knives regularly to reduce wear and strain on augers.



## Processor Service



**SAFETY FIRST!! READ AND UNDERSTAND THE SAFETY INSTRUCTIONS ([Section 2](#)) BEFORE BEGINNING ANY PROCESSOR SERVICE.**



### **WARNING**

Hydraulic fluid under pressure can penetrate skin, resulting in serious injury or death.  
Always relieve hydraulic pressure before disconnecting lines.

Shut off engine, set parking brake and relieve hydraulic pressure before connecting or disconnecting hydraulic lines. Refer to your power unit's manual for instruction on how to relieve hydraulic pressure in lines.

Before applying pressure to the system, be sure that all connections are tight and be sure there are no damaged hoses, lines or fittings.

Wear safety glasses and use metal or wood when searching for leaks. Do not use your hands.



### **WARNING**

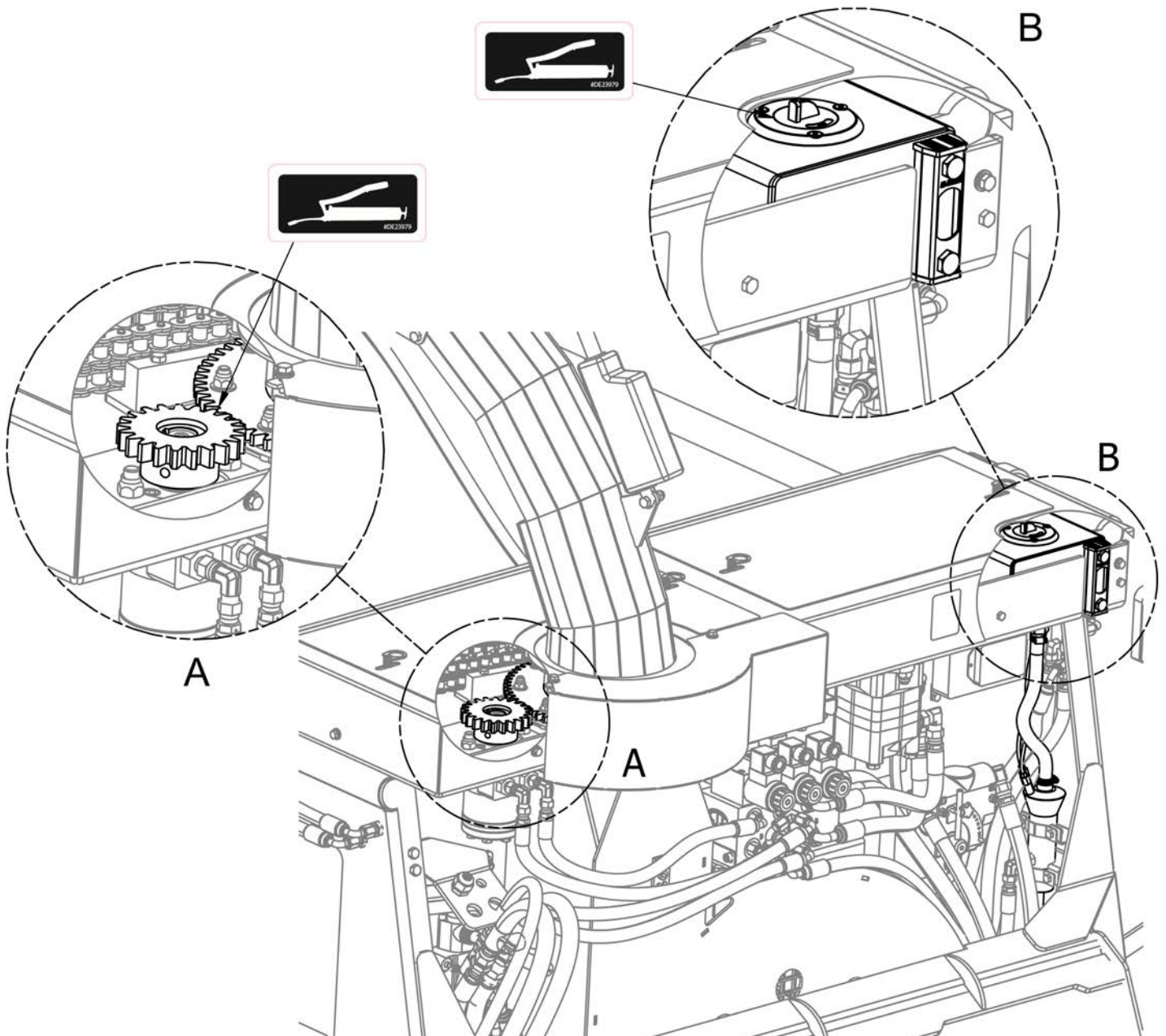
Before servicing the loader, remove the attachment and make certain the lift arms are lowered to their lowest position or that the arms are supported by the mechanical lock up devices (if the machine is so equipped).

Steam-clean the power unit before any installation is made to the hydraulic system.

Remove any attachment from the power unit and position on a level surface.



## Grease Points



ITEM	QTY	AREA	TIMELINE	TYPE
A	2	Chute Direction Gears	Weekly	No.2 Extreme Pressure Grease
B	1	Chain Drive Auto Oiler	Weekly	2 qt. (2 lt.) 85W140 Gear Oil









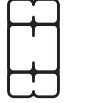

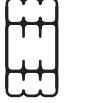


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## Notes

[illegible]

# Imperial Torque Values

SAE Grade and Head Markings	NO MARK	1 or 2 <sup>b</sup> 	5 	5.1 	5.2 	8 	8.2 
SAE Grade and Nut Markings	NO MARK	2 	5 			8 	

Size	Grade 1				Grade 2 <sup>b</sup>				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>	
	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent














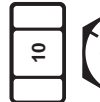






them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

<sup>a</sup> "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

<sup>b</sup> Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

# Metric Torque Values

Property Class and Head Markings	4.8		8.8		9.8		10.9		12.9	
										
Property Class and Nut Markings	5		10		10		10		12	
										

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>		Lubricated <sup>a</sup>		Dry <sup>a</sup>	
	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft	N-m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	255	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you

properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

a "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

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#### **Proposition 65 Warning**

Battery posts, terminals, and similar parts may contain lead which are known to the State of California to cause cancer and reproductive harm. Wear gloves and wash hands after handling.

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