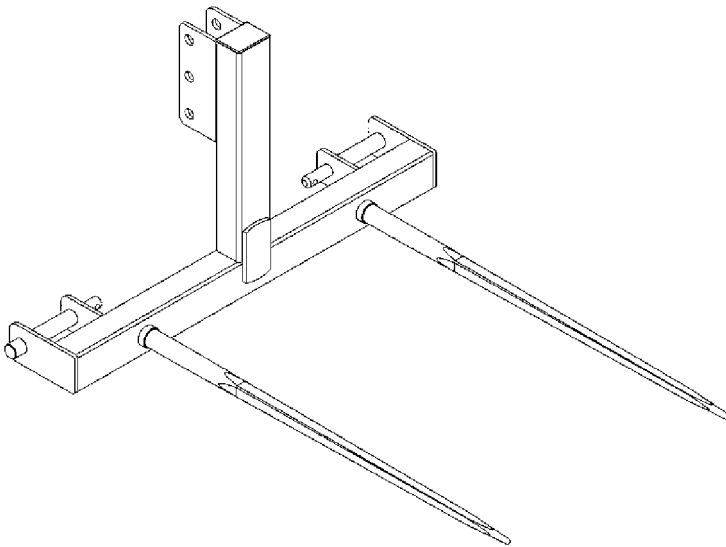
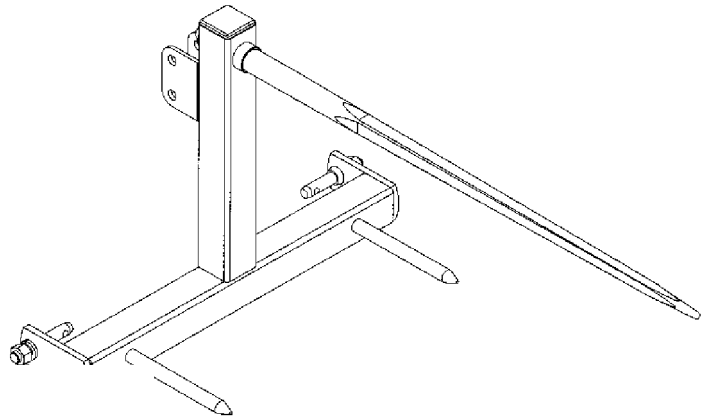


OWNER'S / OPERATOR'S MANUAL

3 PT. HITCH BALE SPEARS

HS1001

HS1002



FRONTIER
EQUIPMENT™

TO THE DEALER:

Assembly and proper installation of this product is the responsibility of the Frontier dealer. Read manual instructions and safety rules. Make sure all items on the Dealer's Pre-Delivery and Delivery Check Lists in the Owner's/Operator's Manual are completed before releasing equipment to the owner.

The dealer must complete the Warranty Registration located on the Frontier website.

TO THE OWNER:

Read this manual before operating your Frontier equipment. The information presented will prepare you to do a better and safer job. Keep this manual handy for ready reference. Require all operators to read this manual carefully and become acquainted with all the adjustment and operating procedures before attempting to operate. Replacement manuals can be obtained from your selling dealer.

The equipment you have purchased has been carefully engineered and manufactured to provide dependable and satisfactory use. Like all mechanical products, it will require cleaning and upkeep. Lubricate the unit as specified. Observe all safety information in this manual and safety decals on the equipment.

For service, your authorized Frontier dealer has trained mechanics, genuine Frontier service parts, and the necessary tools and equipment to handle all your needs.

Use only genuine Frontier service parts. Substitute parts will void the warranty and may not meet standards required for safe and satisfactory operation. Record the model number and serial number of your equipment in the spaces provided:

Model: _____ **Date of Purchase:** _____

Serial Number: (see Safety Decal section for location) _____

Provide this information to your dealer to obtain correct repair parts.

Throughout this manual, the term **IMPORTANT** is used to indicate that failure to observe can cause damage to equipment. The terms **CAUTION**, **WARNING** and **DANGER** are used in conjunction with the Safety-Alert Symbol, (a triangle with an exclamation mark), to indicate the degree of hazard for items of personal safety.



This Safety-Alert Symbol indicates a hazard and means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed.



Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

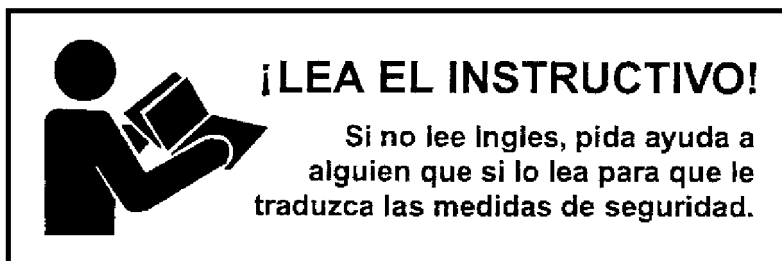


Indicates that failure to observe can cause damage to equipment.

Indicates helpful information.

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SPECIFICATIONS

	HS1001	HS1002
Bale Weight Capacity	2,200 lbs. (998 kg.)	3,000 lbs. (1,361 kg.)
Main Spear(s)	One 2,200 lbs. (998 kg.) Tapered Forged Spear 44" (112 cm.) Useable Length	Two 2,200 lbs. (998 kg.) Tapered Forged Spear 44" (112 cm.) Useable Length 27" (69 cm.) Apart
Balance Spears	Two 1 1/4" (31.7 mm.) Dia. Spears 10" (25.4 cm.) Long	None Required
Frame Construction	3" x 3" (76.2 x 76.2 mm.) Square Tubing	4" x 4" (101.6 x 101.6 mm.) Square Tubing
Hitch Category	I & II	II & III
For Quick Hitch	Category I or Category II with Optional Bushings	Category II Category III Category III N
Drawpin Size	Cat. I (7/8") (22.2 mm.) Optional Cat. II (1 1/8") (28.6 mm.) Available	Cat. II & Cat. III Step-Pin
Implement Weight (Mass)	75 lbs. (34 kg.)	148 lbs. (67 kg.)

GENERAL INFORMATION

The purpose of this manual is to assist you in operating and maintaining your Bale Spear. Read it carefully. It furnishes information and instructions that will help you achieve years of dependable performance.

These instructions have been compiled from field experience and engineering data. Some information may be general in nature, due to unknown and varying operating conditions. However, through experience and these instructions, you should be able to develop procedures suitable to your particular situation.

The illustrations and data used in this manual were current at the time of printing. However, due to possible inline production changes, your machine may vary slightly in detail. We reserve the right to redesign and change the machines as may be necessary without notification.

Throughout this manual, references are made to right and left direction. These are determined by standing behind the tractor facing the direction of forward travel.

2 Introduction



SAFETY RULES



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by an operator's single careless act.

In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, judgement, and proper training of personnel involved in the operation, transport, maintenance and storage of equipment.

It has been said "The best safety device is an informed, careful operator." We ask you to be that kind of operator.

TRAINING

■ Safety instructions are important! Read all attachment and power unit manuals; follow all safety rules and safety decal information. (Replacement manuals are available from selling dealer.) Failure to follow instructions or safety rules can result in serious injury or death.

■ If you do not understand any part of this manual and need assistance, see your dealer.

■ Operators must be instructed in and be capable of the safe operation of the equipment, its attachments, and all controls. Do not allow anyone to operate this equipment without proper instructions.

■ Never allow children or untrained persons to operate equipment.

■ Train all new personnel and review instructions frequently with existing workers. A person who has not read and understood all operating and safety instructions is not qualified to operate the machine. An untrained operator exposes himself and bystanders to possible serious injury or death.

PREPARATION

■ Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

■ Make sure attachment is properly secured, adjusted, and in good operating condition.

■ Power unit must be equipped with ROPS or ROPS cab and seat belt. Keep seat belt securely fastened. Falling off power unit can result in death from being run over or crushed. Keep foldable ROPS system in "locked up" position at all times.

■ A minimum 20% of tractor, attachment and bale weight must be on the tractor front wheels when attachments are in handling position. Without this weight, tractor could tip over, causing personal injury or death. The weight may be attained with a loader, front wheel weights, ballast in tires or front tractor weights. Weigh the tractor, equipment, and bale. Do not estimate.

HANDLING & TRANSPORTATION

■ Always comply with all state and local laws governing highway safety and lighting and marking requirements.

■ Never allow riders on power unit or attachment.

■ Do not operate or handle bales on steep slopes.

■ Use extreme care and reduce ground speed on slopes and rough terrain.

■ Do not operate or handle bales while under the influence of alcohol or drugs. Consult your doctor about operating this machine while taking prescription medications.

■ Make sure large round bales handled on tractor rear 3 pt. hitch do not obstruct visibility of tractor's flashing lights or SMV sign.

OPERATION

■ Always sit in power unit seat when operating controls or starting engine. Securely fasten seat belt, place transmission in neutral, engage brake, and ensure all other controls are disengaged before starting power unit engine.

■ Know your controls and how to stop engine and attachment quickly in an emergency.



SAFETY RULES



ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

OPERATION (cont'd from page 3)

- Operate only in daylight or good artificial light.
- Keep bystanders away from equipment when backing up to a bale. Make sure that people and animals are not between the spear and the bale.
- Set the tread width of both front and rear tractor wheels wide for increased stability.
- Keep hands, feet, hair, and clothing away from equipment while engine is running. Stay clear of all moving parts.
- Power unit must be equipped with ROPS or ROPS cab and seat belt. Keep seat belt securely fastened. Falling off power unit can result in death from being run over or crushed. Keep foldable ROPS system in "locked up" position at all times.
- Never allow riders on power unit or attachment.
- Look down and to the rear and make sure area is clear before operating in reverse.
- Use extreme care when working close to fences, ditches, other obstructions, or on hill-sides.
- Do not operate or transport on steep slopes.
- Do not stop, start, or change directions suddenly on slopes. Always drive down slopes; never across the face.
- Use extreme care and reduce ground speed on slopes and rough terrain.
- Keep alert and watch the front as well as the rear when working with the 3 pt. bale spear.
- When handling large round bales, keep load as low as practical to maximize tractor stability.
- Never use the tractor or implement to stop a rolling bale.
- Always insert spears completely into the bale. Failure to insert spears into bale can allow bale to roll in an uncontrolled direction.
- Do not handle bales that exceed the bale weight limitations of the implement or tractor. Watch for bales that are frozen to the ground.
- Always make sure bales are placed so the bales are stable.

■ When maneuvering close to buildings or through narrow areas, allow sufficient clearance for the tractor, loader, and rear 3 pt. attachment. Drive slowly.

■ Before leaving operator's seat, lower lift arms and put attachment on the ground. Engage brake, stop engine, remove key, and remove seat belt.

MAINTENANCE

■ Always wear relatively tight and belted clothing to avoid getting caught in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head; and respirator or filter mask where appropriate.

■ Never go underneath equipment (lowered to the ground or raised) unless it is properly blocked and secured. Never place any part of the body underneath equipment or between moveable parts even when the engine has been turned off. Hydraulic system leak down, hydraulic system failures, mechanical failures, or movement of control levers can cause equipment to drop or rotate unexpectedly and cause severe injury or death.

■ Make sure attachment is properly secured, adjusted, and in good operating condition.

■ Before leaving operator's seat, lower lift arms and put attachment on the ground. Engage brake, stop engine, remove key, and remove seat belt.

■ Never perform service or maintenance with engine running.

■ Keep all persons away from operator control area while performing adjustments, service, or maintenance.

■ Tighten nut of forged spears.

■ Make sure all safety decals are installed. Replace if damaged. (See Safety Decals section for location.)

STORAGE

■ Block equipment securely for storage.

■ Keep children and bystanders away from storage area.

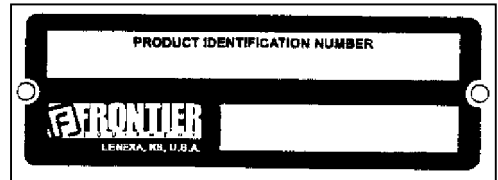
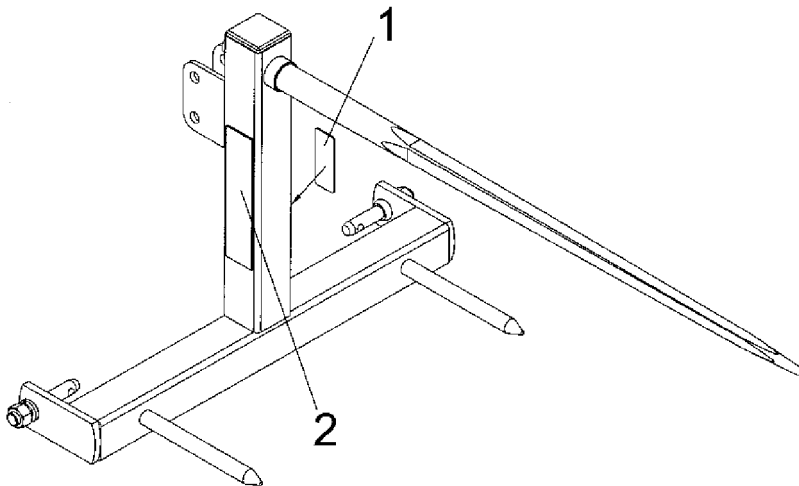
SAFETY & INSTRUCTIONAL DECALS



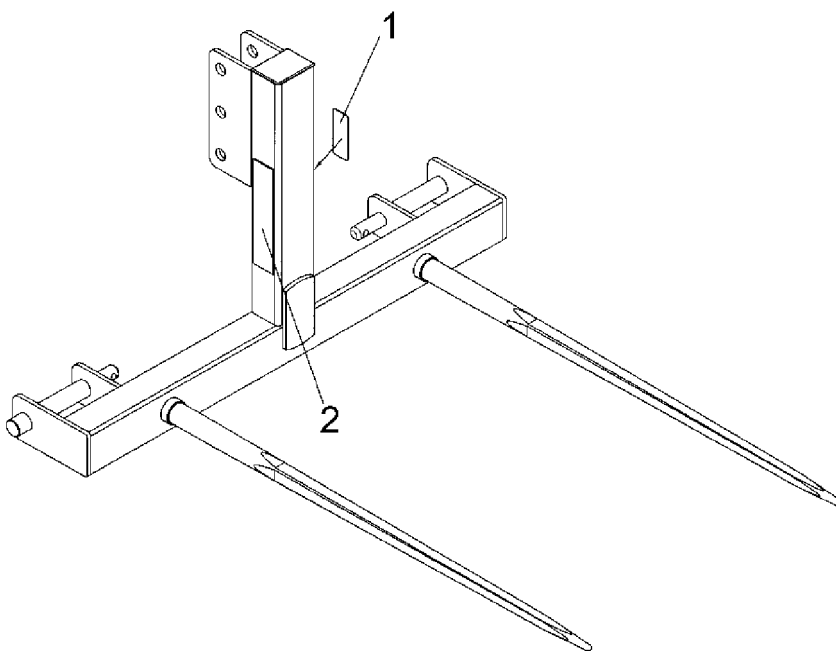
ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



Replace Immediately If Damaged!



1 - Serial Number Plate



**2 —
NS101277**

WARNING

- Read and follow owner's manual before installing, operating, or performing maintenance on this attachment. Observe safety recommendations in manual.
- Do not exceed weight limit of attachment or tractor.
- Do not lift or carry anyone on attachment.
- Attachment should be used with the proper weight package on front of tractor or with a loader installed. When handling loads on both ends of tractor, load rear first and unload last.
- Set wheels wide for increased stability.
- Never raise load to extreme heights on steep inclines.
- When handling large round bale, keep load as low as practical to maximize tractor stability.
- Make sure large round bale transported on tractor rear three point hitch attachment does not obstruct visibility of tractor's flashing lights or SMV sign.
- Do not stand or work under raised attachment.
- Stop engine, lower arms, relieve all hydraulic pressure, and lock brakes before leaving operator's seat.
- Failure to observe the above precautions can result in serious injury or death.

101277

Use a clean, damp cloth to clean safety decals.

Avoid spraying too close to decals when using a pressure washer; high-pressure water can enter through very small scratches or under edges of decals causing them to peel or come off.

Replacement safety decals can be ordered free from your dealer.

DEALER ASSEMBLY

(Dealer's Responsibility)

BOTH MODELS:

Install the forged main spear into the socket(s) in the main frame.

The threads and nut are metric – be sure correct tools are used. Tighten securely to 350 foot-pounds (474 n-m).

Locate the lift pins for the hitch category required and tighten securely to 230 foot-pounds (312 n-m).

DEALER CHECK LISTS

PRE-DELIVERY CHECK LIST

(Dealer's responsibility)

Inspect the equipment thoroughly after assembly to be certain it is set up properly before delivering it to the customer. The following check list is a reminder of points to inspect. Check off each item if it is found satisfactory or after proper adjustment is made.

_____ Check that all safety decals are installed and in good condition. Replace if damaged.

_____ Check all bolts to be sure they are tight.

FOR MODEL HS1001

Category I/II – 3 Pt. Bale Spear

To allow Model HS-1001 to be used with a Quick Hitch (Category I or II),

_____ Order the following:

Lower Hitch Sleeves – Part #5WS862500
Toplink Spacer Bushing – Part #5WS343058

To allow Model HS-1001 to be used on a Category II 3 Pt. Hitch (Non-Quick Hitch),

_____ Order the following:

Package of two (2) Category II Draw Pins –
Part #5WS832140

FOR MODEL HS1002

Category II/III – 3 Pt. Bale Spear

To allow Model HS-1002 to be used with a Quick Hitch (Category II or III or III N),

_____ Order the following:

Toplink Spacer Bushing – Part #5WS590066

DELIVERY CHECK LIST

(Dealer's Responsibility)

_____ Present Owner's/Operator's Manual and request that customer and all operators read it before operating equipment. Point out the manual safety rules, explain their meanings and emphasize the increased safety hazards that exist when safety rules are not followed.

_____ Point out the safety decals. Explain their meaning and the need to keep them in place and in good condition. Emphasize the increased safety hazards when instructions are not followed.

_____ Show customer the safe, proper procedures to be used when mounting, dismounting, and storing equipment.

_____ For mounted units, add wheel weights, ballast in front tires, and/or front tractor weight to enhance front end stability. A minimum 20% of tractor and bale gross weight must be on front tractor wheels. When adding weight to attain 20% of tractor and bale weight on front tractor wheels, you must not exceed the ROPS weight certification. Weigh the tractor, equipment, and bale. Do not estimate!

_____ Show customer how to make adjustments.

_____ Explain to customer the potential crushing hazards of going underneath raised equipment. Instruct customer that service work does not require going underneath unit and never to do so.

_____ Make customer aware of optional equipment available so that customer can make proper choices as required.

_____ Complete the Warranty Registration located on the Frontier website.

OPERATION

Safety is a primary concern in the design and manufacture of our products. Unfortunately, our efforts to provide safe equipment can be wiped out by an operator's single careless act.

In addition to the design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, judgement, and proper training of personnel involved in the operation, transport, maintenance and storage of equipment.

It has been said "The best safety device is an informed, careful operator." We ask you to be that kind of operator.

The operator is responsible for the safe operation of this equipment. The operator must be properly trained. Operators should be familiar with the equipment, the tractor, and all safety practices before starting operation. Read the safety rules and safety decals on pages 3 through page 5.

Rear 3 pt. hitch mounted bale spears are designed, depending on model, to handle up to either 2,200 lb. (998 kg.) or 3,000 lb. (1,361 kg.) bales. All models feature a tapered "forged" spring steel spear designed for tight center bales allowing easier spear penetration into and withdrawal from bales. A special tapered socket provides support for the spear.



WARNING

■ **Power unit must be equipped with ROPS or ROPS cab and seat belt. Keep seat belt securely fastened. Falling off power unit can result in death from being run over or crushed. Keep foldable ROPS systems in "locked up" position at all times.**



WARNING

- **Never allow children or untrained persons to operate equipment.**
- **Keep bystanders away from equipment.**
- **Never allow riders on power unit or attachment.**



WARNING

■ **A minimum 20% of tractor and bale weight must be on the tractor front wheels when handling large round bales. Without this weight, tractor could tip over, causing personal injury or death. The weight may be attained with a loader, front wheel weights, ballast in tires or front tractor weights. Weigh the tractor, equipment, and bale. Do not estimate.**

■ **NEVER GO UNDERNEATH EQUIPMENT. Never place any part of the body underneath equipment or between moveable parts even when the engine has been turned off. Hydraulic system leak down, hydraulic system failures, mechanical failures, or movement of control levers can cause equipment to drop or rotate unexpectedly and cause severe injury or death.**

- **Service work does not require going underneath.**
- **Read Manual for service instructions or have service performed by a qualified dealer.**

■ **Keep all persons away from operator control area while performing adjustments, service, or maintenance.**

OWNER/OPERATOR PRE-OPERATION CHECK LIST

(Owner's/Operator's responsibility)

- ____ Review and follow all safety rules and safety decal instructions on pages 3 through page 5.
- ____ Check that equipment is properly and securely attached to tractor.

- ____ Check that all safety decals are installed and in good condition. Replace if damaged.
- ____ Check that all hardware is properly installed and secured.
- ____ Do not allow riders.
- ____ Make sure tractor ROPS or ROPS CAB and seat belt are in good condition. Keep seat belt securely fastened during operation.

8 Operation

Operation *Cont'd*



CAUTION

■ Always wear relatively tight and belted clothing to avoid entanglement in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head.



WARNING

■ Do not exceed the maximum recommended large round bale weight listed for each of the loader spear models. Damage to the equipment or serious personal injury could result.

CONNECTING 3 PT. BALE SPEAR TO TRACTOR

The required size of the tractor will be determined by the size and weight of the bales to be handled.

Remember, high moisture hay (silage) bales are very heavy in relation to similar size dry hay bales.

Always use a tractor large enough to safely handle your bales.

The Model HS1001 3 pt. bale spear is compatible with Category I and II, 3 point tractors equipped with side swing-type lower lift arms.

The Model HS1002 3 pt. bale spear is compatible with Category II and III, 3 point tractors equipped with side swing-type lower lift arms.

1. To avoid interference with the bale spear, adjust tractor drawbar to the shortest and highest position.
2. Attach the tractor's lower lift arms to the bale spear and secure in place with lock pin.

For the Model HS1001 3 pt. spear and Category I hitches, the draw pins go to the inside of the lower lift brackets. For Category II hitches and Category II Quick Hitch, the draw pins go to the outside of the lift brackets (with the addition of the 5WS862500 bushings).

For Category II hitches where a Quick Hitch is NOT used, install the optional Category II draw pins to the outside of the lift brackets. (Order part #5WS832140).

3. Tractor must be equipped with stabilizer bars, adjustable sway chains, or sway blocks to keep the implement and bale from swinging side to side.
4. Attach the tractor's top link to the top of the bale spear mast and secure with the top link pin and retaining pin supplied with the top link.

Model HS1001

For Category I Quick Hitch application, order optional bushing kit part #5WS862500 (one pair); place bushing over draw pin and fasten with roll pin.

Also order part #5WS343058 (one) toplink spacer bushing.

For Category I hitches, the draw pins go to the inside of the lower lift brackets.

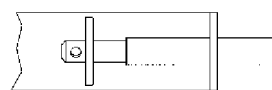
For Category II Quick Hitch application, order optional bushing kit part #5WS862500 (one pair); place bushing over draw pin and fasten with roll pin.

Also order part #5WS343058 (one) toplink spacer bushing.

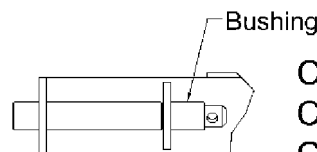
For Category II hitches, the draw pins go to the outside of the lower lift brackets.

Model HS1002

Attach the bale spear to the tractor. The lower stepped hitch pins allow connecting to both Category II and Category III hitches or Quick hitches.



Cat II Hitch



Cat II Q. Hitch
Cat III Hitch
Cat III Q. Hitch

Connect the toplink with a Category II toplink pin. If your toplink is a Category III, use a Category II to III toplink bushing (available at your dealer).

Operation *Cont'd*

OPERATION

NOTE: The model HS1002 is not designed for handling pallets or large square bales.

Attaching the 3 pt. bales spear to the tractor increases the overall length of the working unit. Allow additional clearance for the implement and bale when turning.

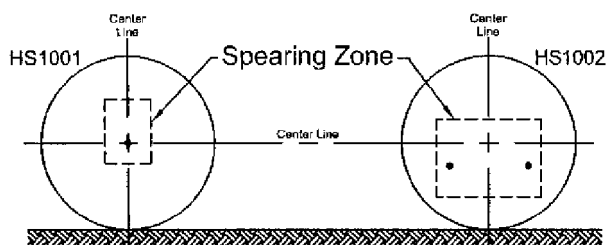


WARNING

■ **A heavy load can cause instability in driving a tractor. Make sure the tractor is properly counter-balanced with weights. Always drive slowly – especially around turns. An unstable tractor could steer badly and possibly tip over, causing injury or death.**

If you are handling bales with both the front end loader and the 3 pt. hitch on the tractor, always load the 3 pt. attachment first and unload last.

With the tractor, push the spear into the large hay bale. Make sure you have fully engaged the hay bale so the bale doesn't want to come off the end of the spear. If, when you initially pick the bale up, it tends to droop rearward, this would indicate you have not penetrated the bale far enough.



Ideal Location for Bale Spears

Always have spears inserted into bale
(Never under the bale)

NOTE: Soft center bales will tend to droop after being lifted by a single spear. Placing the spear in a lower position will allow for more lifting height and lessen the load on the stabilizer spears.

NOTE: Always make sure bale spear fully penetrates the bale. Partial penetration locates all the weight of the bale on the outer end and can damage spear.

NOTE: In cold weather, a bale frozen to the ground may exceed the lifting capacity of spear and attachment. Damage to spear or attachment may occur. Not covered under warranty. Loosen frozen bales from ground before attempting to lift with 3 pt. hitch.

Raise the three point hitch. Attempting to raise the bale with the spear(s) only partially inserted may cause the spears to bend.

Drive to the desired location, lower the bale to the ground and drive away from the bale.

The model HS1002 has two forged spears. This allows the handling of round bales without the bale turning. Bales can be handled in the same position each time. The model HS1002 can also handle heavier bales.

HANDLE ROUND BALES SAFELY

- Do not handle bales that exceed the bale weight limitations of the bale spear.
- Carry the bale slowly and as low as possible to the ground.
- Operate the hydraulic controls smoothly, avoiding jerky operation.
- Never use the tractor to stop a rolling bale.
- Only use a tractor equipped with a ROPS cab or roll-over protective structure.

10 Operation

Operation *Cont'd*

HANDLE ROUND BALES SAFELY (*cont'd*)

- Travel slowly over rough ground or when making turns.
- Allow for additional length of bale on tractor while turning.
- Use particular care when working on inclines and hillsides.

Pay particular close attention to the Safety Messages regarding handling and transport. Avoid unnecessary injuries and equipment damage by exercising cautious, conscientious travel procedures.

TRANSPORTING

Make sure large round bales handled on tractor rear 3 pt. hitch do not obstruct visibility of tractor's flashing lights or SMV sign.

OWNER SERVICE

The information in this section is written for operators who possess basic mechanical skills. If you need help, your dealer has trained service technicians available. For your protection, read and follow the safety information in this manual.



WARNING

■ **NEVER GO UNDERNEATH EQUIPMENT.** Never place any part of the body underneath equipment or between moveable parts even when the engine has been turned off. Hydraulic system leak down, hydraulic system failures, mechanical failures, or movement of control levers can cause equipment to drop or rotate unexpectedly and cause severe injury or death.

- Service work does not require going underneath.
- Read Manual for service instructions or have service performed by a qualified dealer.



CAUTION

■ **Always wear relatively tight and belted clothing to avoid entanglement in moving parts. Wear sturdy, rough-soled work shoes and protective equipment for eyes, hair, hands, hearing, and head.**



WARNING

■ **Keep all persons away from operator control area while performing adjustments, service, or maintenance.**

■ **Before dismounting power unit or performing any service or maintenance, follow these steps: disengage power to equipment, lower the 3 point hitch and all raised components to the ground, operate valve levers to release any hydraulic pressure, set parking brake, stop engine, remove key, and unfasten seat belt.**

MAINTENANCE

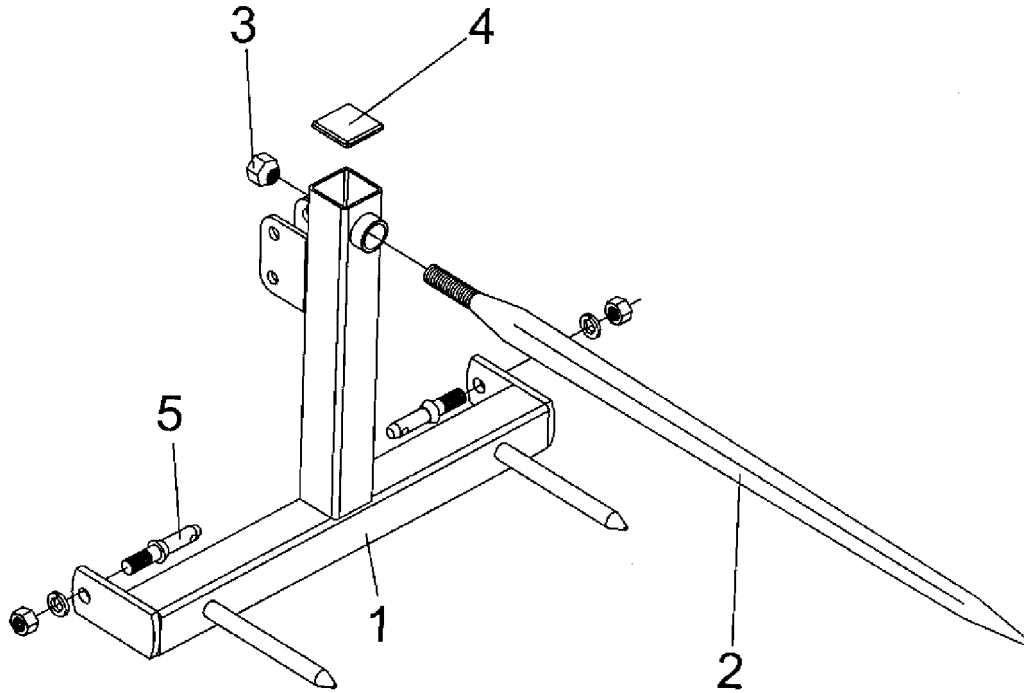
Check the large nut on the forged spears to make sure it is tight. Tighten to 350 foot-pounds (474 n-m).

Repaint parts where paint is worn or scratched to prevent rust.

STORING SAFELY

- Always store the bale spear in a clean, dry location away from children and livestock.
- Store with spears pointing against building or other stable object.
- Storage location should be level and solid to make hitching and unhitching easy.

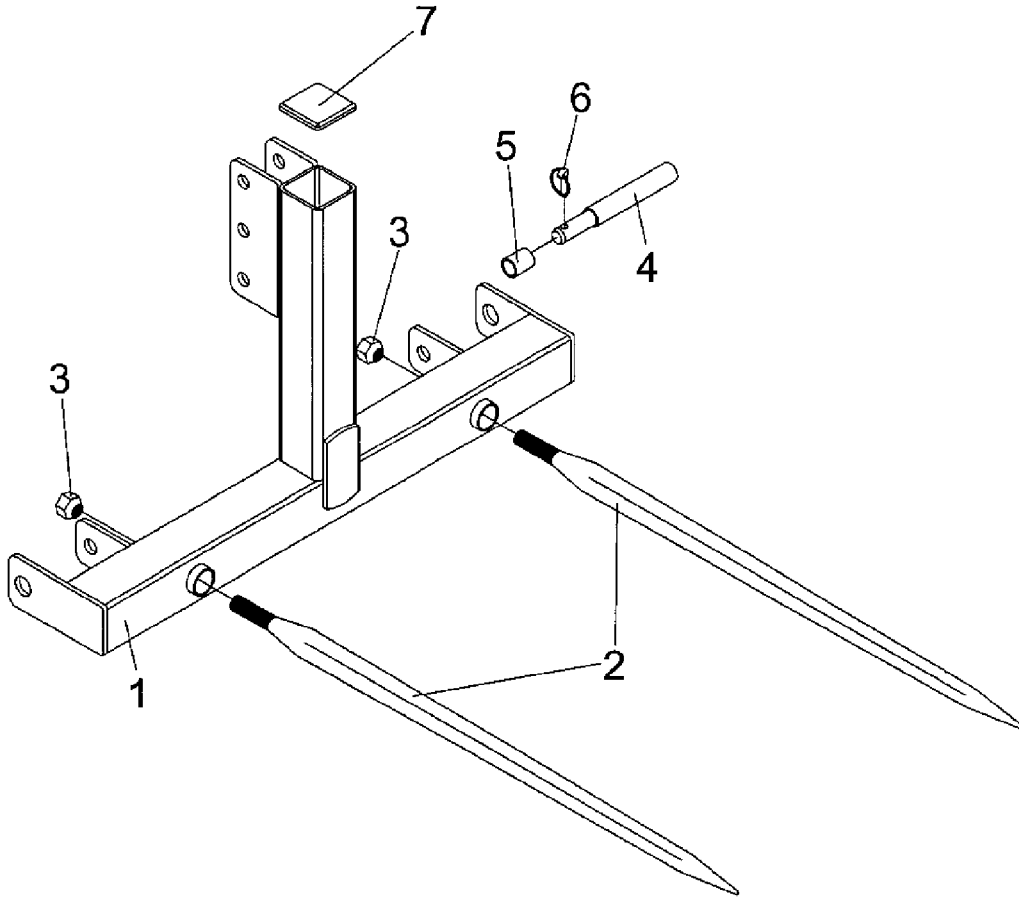
3 PT. BALE SPEAR PARTS (Model HS1001)



Ref. No.	Part No.	Description	No. Req'd.
1	5WS832075	Hay Frame Weldment (HS1001)	1
2	5WS831273	Tine CII 49" Spear	1
3	5WS831274	M 28 Nut	1
4	5WS2504308	Cap, Plastic (80mm) Pur.	1
5	5WS590108	Draw Pin Cat. I (AK-578)	2
N/S	5WS101277	Safety Sign – Caution (Frontier Hay)	1
N/S	5WS862500	Optional Lower Sleeves for Quick Hitch (Cat. I / II) (pair)	1
N/S	5WS343058	Optional Toplink Bushing for Quick Hitch (Cat. I / II)	1
N/S	5WS832140	Optional Cat. II Drawpins (AK-2118) (pair)	1

12 Parts

3 PT. BALE SPEAR PARTS (Model HS1002)



Ref. No.	Part No.	Description	No. Req'd.
1	5WS832065	Hay Frame Weldment (HS1002)	1
2	5WS831273	Tine CII 49" Spear	2
3	5WS831274	M 28 Nut	2
4	5WS830290	Pin, Hitch	2
5	5WS590126	AK-58 Lift Arm Bushing	2
6	5WS590006	AK-14 Linch Pin 7/16"	2
7	5WS2504300	Cap, Plastic (100mm) Pur.	1
N/S	5WS101277	Safety Sign – Caution (Frontier Hay)	1
N/S	5WS590066	Optional Toplink Bushing (Cat. II / III)	1

BOLT TORQUE CHART

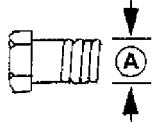
Always tighten hardware to these values unless a different torque value or tightening procedure is listed for a specific application.

Fasteners must always be replaced with the same grade as specified in the manual parts list.

Always use the proper tool for tightening hardware: SAE for SAE hardware and Metric for metric hardware.

Make sure fastener threads are clean and you start thread engagement properly.

All torque values are given to specifications used on hardware defined by SAE J1701 & J1701M JUL96.



SAE SERIES TORQUE CHART



SAE Bolt Head Identification

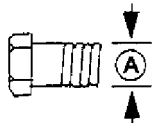


SAE Grade 5 (3 Radial Dashes)



SAE Grade 8 (6 Radial Dashes)

A Diameter (Inches)	Wrench Size	MARKING ON HEAD					
		SAE 2		SAE 5		SAE 8	
		lbs-ft	N-m	lbs-ft	N-m	lbs-ft	N-m
1/4"	7/16"	6	8	10	13	14	18
5/16"	1/2"	12	17	19	26	27	37
3/8"	9/16"	23	31	35	47	49	67
7/16"	5/8"	36	48	55	75	78	106
1/2"	3/4"	55	75	85	115	120	163
9/16"	13/16"	78	106	121	164	171	232
5/8"	15/16"	110	149	170	230	240	325
3/4"	1-1/8"	192	261	297	403	420	569
7/8"	1-5/16"	306	416	474	642	669	907
1"	1-1/2"	467	634	722	979	1020	1383



METRIC SERIES TORQUE CHART



Metric Grade 8.8

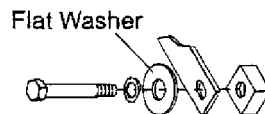
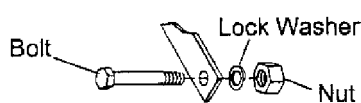
Metric Bolt Head Identification



Metric Grade 10.9

A Diameter & Thread Pitch (Millimeters)	Wrench Size	COARSE THREAD				FINE THREAD				A Diameter & Thread Pitch (Millimeters)
		MARKING ON HEAD				MARKING ON HEAD				
		Metric 8.8		Metric 10.9		Metric 8.8		Metric 10.9		
		N-m	lbs-ft	N-m	lbs-ft	N-m	lbs-ft	N-m	lbs-ft	
6 x 1.0	10 mm	8	6	11	8	8	6	11	8	6 x 1.0
8 x 1.25	13 mm	20	15	27	20	21	16	29	22	8 x 1.0
10 x 1.5	16 mm	39	29	54	40	41	30	57	42	10 x 1.25
12 x 1.75	18 mm	68	50	94	70	75	55	103	76	12 x 1.25
14 x 2.0	21 mm	109	80	151	111	118	87	163	120	14 x 1.5
16 x 2.0	24 mm	169	125	234	173	181	133	250	184	16 x 1.5
18 x 2.5	27 mm	234	172	323	239	263	194	363	268	18 x 1.5
20 x 2.5	30 mm	330	244	457	337	367	270	507	374	20 x 1.5
22 x 2.5	34 mm	451	332	623	460	495	365	684	505	22 x 1.5
24 x 3.0	36 mm	571	421	790	583	623	459	861	635	24 x 2.0
30 x 3.0	46 mm	1175	867	1626	1199	1258	928	1740	1283	30 x 2.0

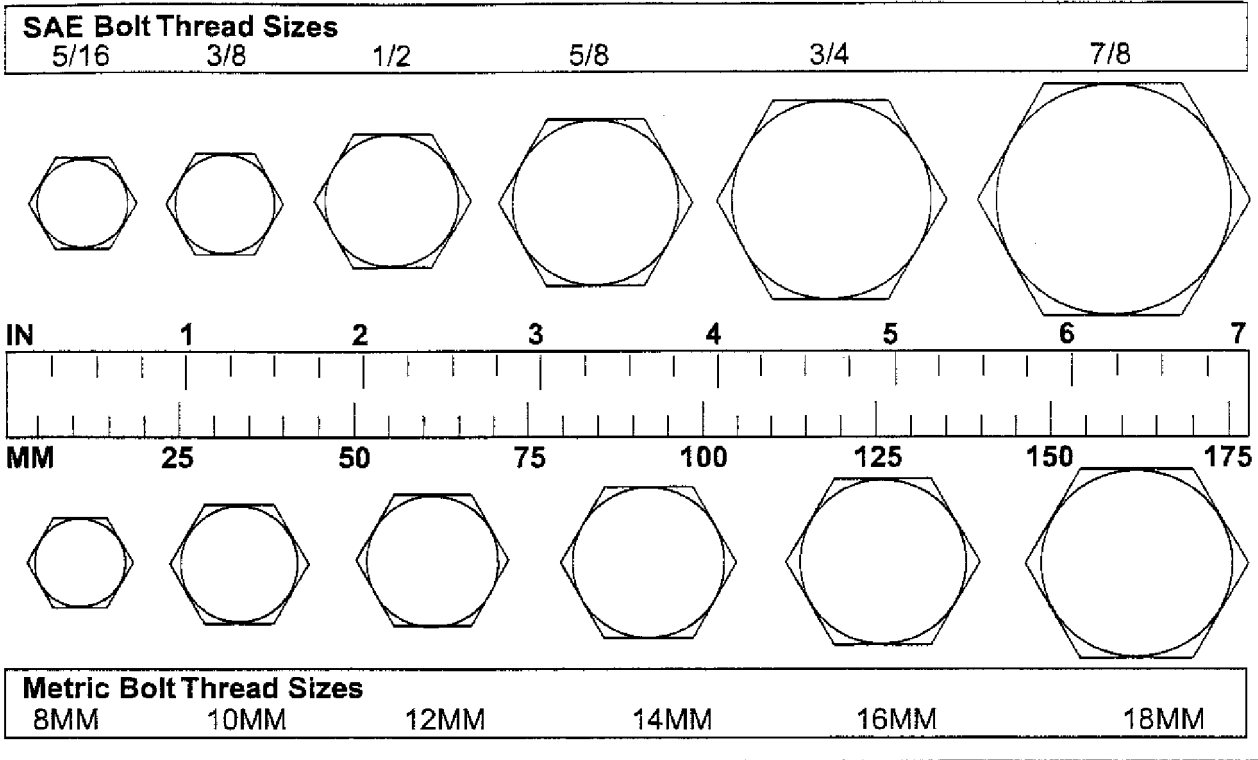
Typical Washer Installations



8/9/00

BOLT SIZE CHART

NOTE: Chart shows bolt thread sizes and corresponding head (wrench) sizes for standard SAE and metric bolts.



ABBREVIATIONS

AG.....Agriculture
 ATF.....Automatic Transmission Fluid
 BSPP.....British Standard Pipe Parallel
 BSPTM.....British Standard Pipe Tapered Male
 CV.....Constant Velocity
 CCW.....Counter-Clockwise
 CW.....Clockwise
 F.....Female
 GA.....Gauge
 GR (5, etc.).....Grade (5, etc.)
 HHCS.....Hex Head Cap Screw
 HT.....Heat Treated
 JIC.....Joint Industry Council 37° Degree Flare
 LH.....Left Hand
 LT.....Left
 m.....Meter
 mm.....Millimeter
 M.....Male
 MPa.....Mega Pascal
 N.....Newton

NC.....National Coarse
 NF.....National Fine
 NPSM.....National Pipe Straight Mechanical
 NPT.....National Pipe Tapered
 NPT SWF.....National Pipe Tapered Swivel Female
 ORBM.....O-Ring Boss - Male
 P.....Pitch
 PBY.....Power Beyond
 psi.....Pounds per Square Inch
 PTO.....Power Take Off
 QD.....Quick Disconnect
 RH.....Right Hand
 ROPS.....Roll Over Protective Structure
 RPM.....Revolutions Per Minute
 RT.....Right
 SAE.....Society of Automotive Engineers
 UNC.....Unified Coarse
 UNF.....Unified Fine
 UNS.....Unified Special

PART NO.
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